NEW DATA AND CHARTS ON PIPE LINE LOSSES

THE HEATING AND VENTILATING MAGAZINE

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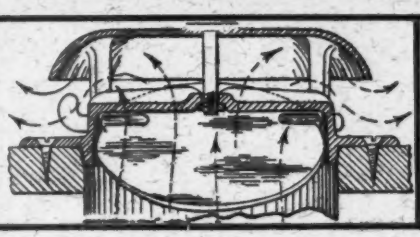

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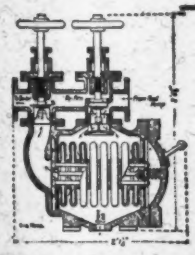

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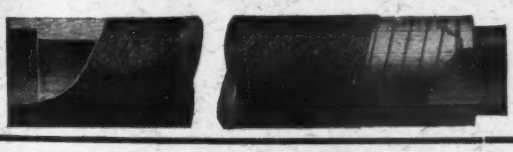

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK AUGUST, 1911

Central Station Heating

5.—PIPE LINE LOSSES FROM FRICTION

BY BYRON T. GIFFORD

(Previous articles in this series: "Pipe Line Losses from Radiation," April, 1911; "Rates," May, 1911; "'Ready to Serve' or 'Maximum Demand' Rate," June, 1911; "Operation," July, 1911)

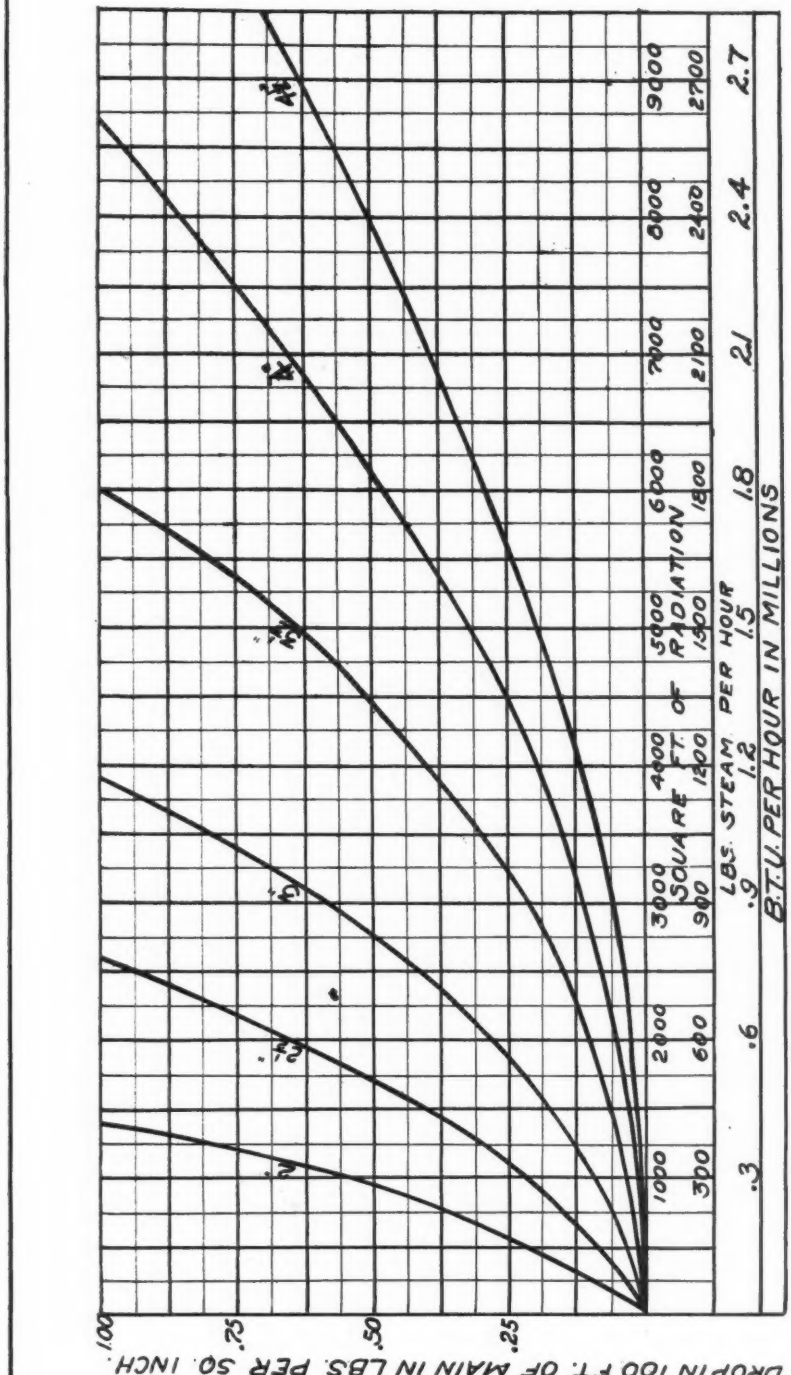
Loss Due to Friction

Steam Mains.—Many different formulas and tables are in use for figuring the loss due to friction. The velocity, quantity of steam flowing, as well as the pressure, affect the friction on the sides of the pipe and, if the steam flows in the opposite direction to the condensation, we add another factor which materially affects the friction loss, due to the skin friction of the water and the steam, as well as the partial choking of the pipe area, on account of the depth of water necessary to give the condensation sufficient head to drain back.

As a rough method of estimating friction loss in heat units use may be made of the pipe capacity curves here given.

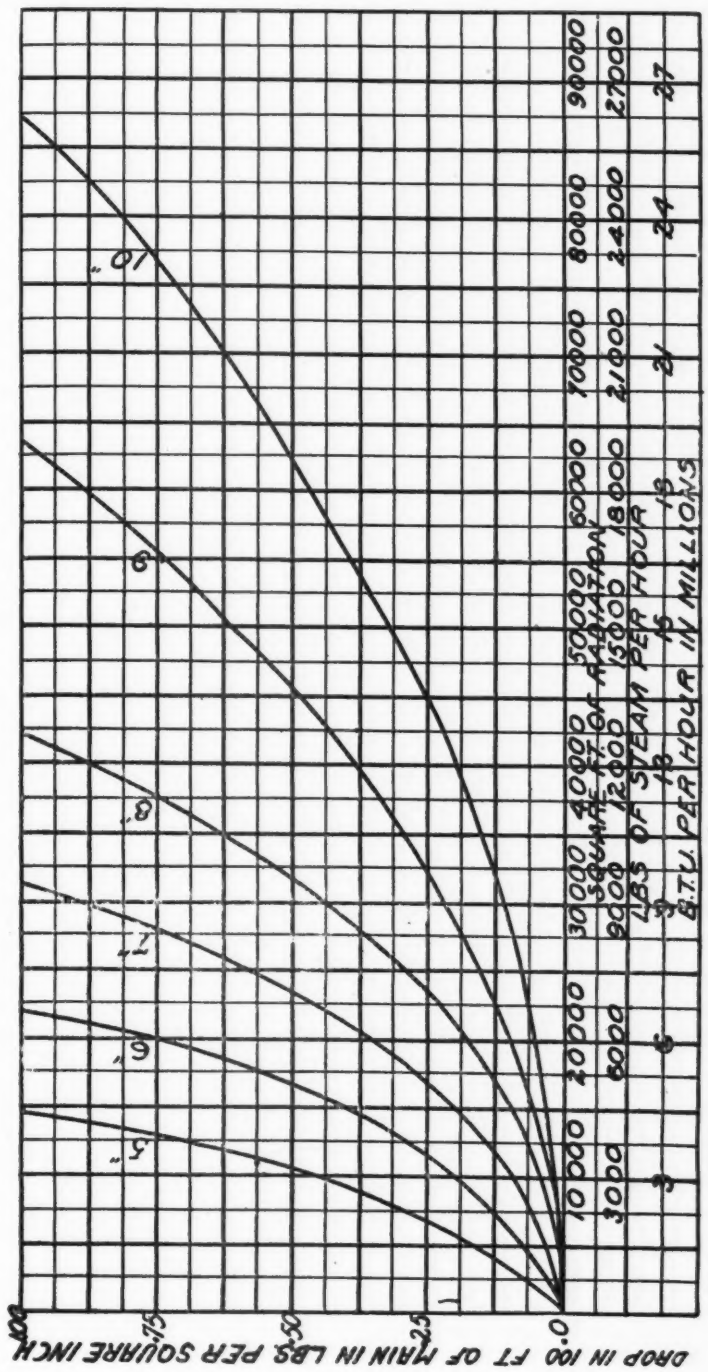
Multiply the pressure drop given on the curves (Charts Nos. 1, 2 and 3) by the factor or constant 0.2. This will give the number of heat units lost per pound of steam. This product multiplied by the number of pounds of steam per hour will give the total heat units lost per hour in low pressure steam mains.

By referring to Pipe Capacity Chart No. 1:
1000 lbs. steam per hour in a 4-in. pipe 1000 ft. long.
Loss = $1.2 \times 0.2 \times 1000 = 240$ B.T.U.
Same in a 3-in. pipe = $7.3 \times 0.2 \times 1000 = 1460$ B.T.U.
Same in a 3½-in. pipe = $2.5 \times 0.2 \times 1000 = 500$ B.T.U.



PRESSURE DROP IN STEAM MAINS, 2-IN. TO 4½-IN., BOTH INCLUSIVE.

Based on 0.33 lbs. Steam per square foot of Radiation per Hour. Also 1 lb. = 1000 B. T. U. Radiation Loss = 0.05 lbs. of Steam per Hour per Square Foot of Underground Surface.



PRESSURE DROP IN STEAM MAINS, 5-IN. TO 10-IN., BOTH INCLUSIVE

Based on 0.33 lbs. Steam per Square Foot of Radiation per Hour. Also 1 lb. of Steam = 1000 B. T. U. Radiation L_{oss} = 0.05 lbs. of Steam per Square Foot of Underground Surface.

Water Mains.—We have about the same conditions affecting the friction in water pipe lines that we have in steam pipes, the velocity, the quantity and the pressure. The natural laws of gravity also affect the flow.

To estimate the loss in B.T.U. in the friction of water pipes, refer to the pipe curves for water and use the following formula:

Example:—15,000 sq. ft. radiation, 5-in. pipe 1000 ft. long. From curve, friction drop is 0.52 lbs.

Loss in B.T.U. $= 0.046 \times F \times R \times L$

0.046 = a constant.

F = friction drop in lbs. per 100 ft.

R = radiation shown by table.

L = length in 100 ft.

In the case cited,

B.T.U. loss by friction $= 0.046 \times 0.52 \times 15{,}000 \times 10 =$ 3588 B.T.U. per hour.

The value of this constant 0.046 takes into consideration using the exhaust steam from the pumps in the heating system and also the usual circulating pump efficiency, which, in reciprocating pumps, is very low.

Combining the Losses from Radiation and Friction to Find the Most Economical-Sized Pipe Line.

Steam.—Given 1000 lbs. per hour to carry 1000 ft.

From our pipe curve for steam (Chart No. 1) we see that a 3-in., 3½-in., 4-in. and 4½-in. pipe will do this nicely but we must determine the most economical one.

Loss by friction according to formula:

3 -in. line = 1460 B.T.U.
3½-in. line = 500 B.T.U.
4 -in. line = 250 B.T.U.
4½-in. line = 130 B.T.U.

Radiation loss according to formula:

Value of C = 0.05

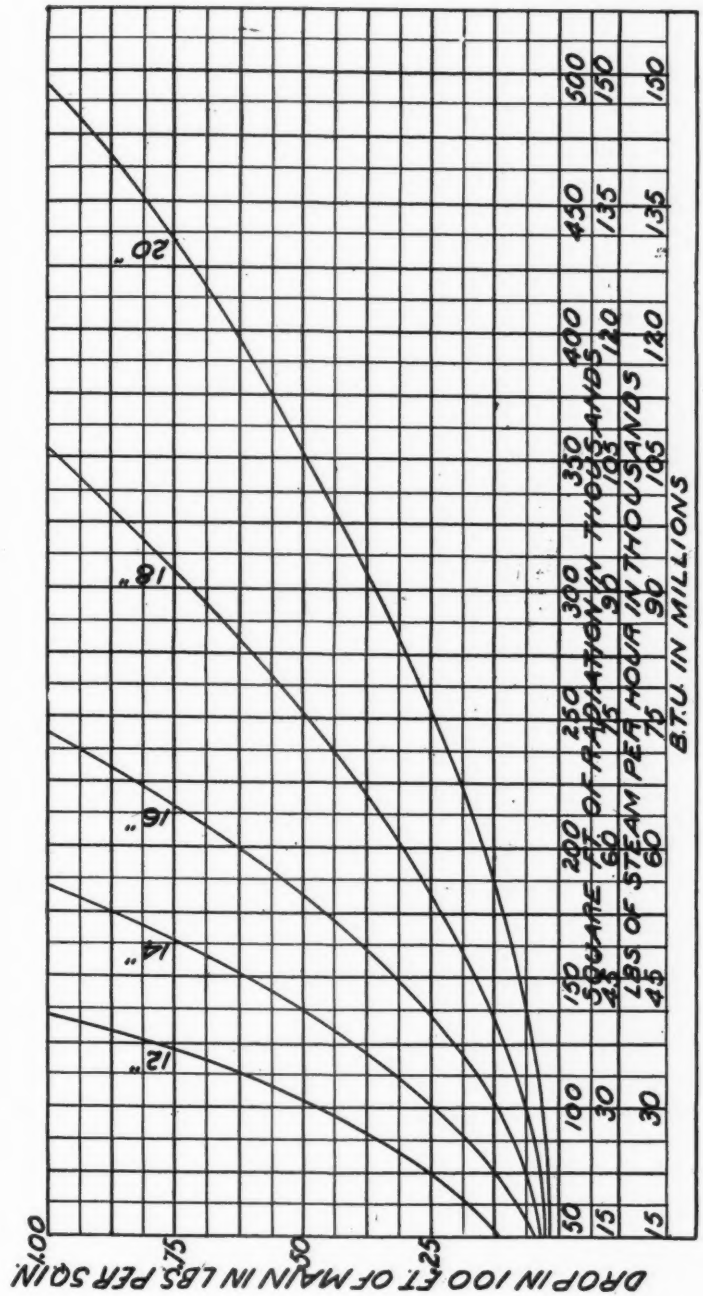
Assuming 1 lb. of steam = 1000 B.T.U.

3 -in. line = 45,800 B.T.U.
3½-in. line = 52,350 B.T.U.
4 -in. line = 58,900 B.T.U.
4½-in. line = 65,450 B.T.U.

Total loss:

3 -in. line = 47,260 B.T.U.
3½-in. line = 52,850 B.T.U.
4 -in. line = 59,150 B.T.U.
4½-in. line = 65,580 B.T.U.

This shows conclusively that the 3-in. line is the most economical to run, provided it does not affect our station



PRESSURE DROP IN STEAM MAINS, 12-IN. TO 20-IN., BOTH INCLUSIVE.

Based on 0.33 lb. Steam per Square Foot of Radiation per Hour. Also 1 lb. of Steam = 1000 B. T. U. Radiation Loss = 0.05 lbs. of Steam per Square Foot of Underground Surface.

conditions by causing excessive back pressure. From our pipe curve we find it will cause a drop of 7.3 lbs., which, with 1 lb. at the end of the line, means 8.3 lbs. at the station. If this does not affect our engines a 3-in. line would be the one to run, but, if we must keep our back-pressure below 5 lbs., we would be obliged to run a 3½-in. line.

Water.—Combining the friction loss and radiation loss in water pipe lines, we will assume a case.

Given 15,000 sq. ft. of radiation to heat 1000 ft. distant.

From our pipe capacity tables (Chart No. 4) we find that a 4-in., 4½-in., 5-in. or 6-in. pipe will handle this work. Asssume a pipe line loss, owing to class of insulation used, to be 30 B.T.U. per square foot of pipe surface per hour.

Radiation loss = from formula (H = sq. ft. × C).

4 -in. line = (1.178 × 30) × 1000 = 35,340 B.T.U.
4½-in. line = (1.309 × 30) × 1000 = 39,270 B.T.U.
5 -in. line = (1.456 × 30) × 1000 = 43,680 B.T.U.
6 -in. line = (1.734 × 30) × 1000 = 52,020 B.T.U.

Friction loss = from formula (L = 0.046 x F × R × L).

4 -in. line = 0.046 × 1.75 × 15,000 × 10 = 11,775 B.T.U.
4½-in. line = 0.046 × 1.1 × 15,000 × 10 = 7,590 B.T.U.
5 -in. line = 0.046 × 0.52 × 15,000 × 10 = 3,588 B.T.U.
6 -in. line = 0.046 × 0.25 × 15,000 × 10 = 1,725 B.T.U.

Combined radiation and friction losses.

4 -in. line = 47,115 B.T.U.
4½-in. line = 46,860 B.T.U.
5 -in. line = 47,268 B.T.U.
6 -in. line = 53,745 B.T.U.

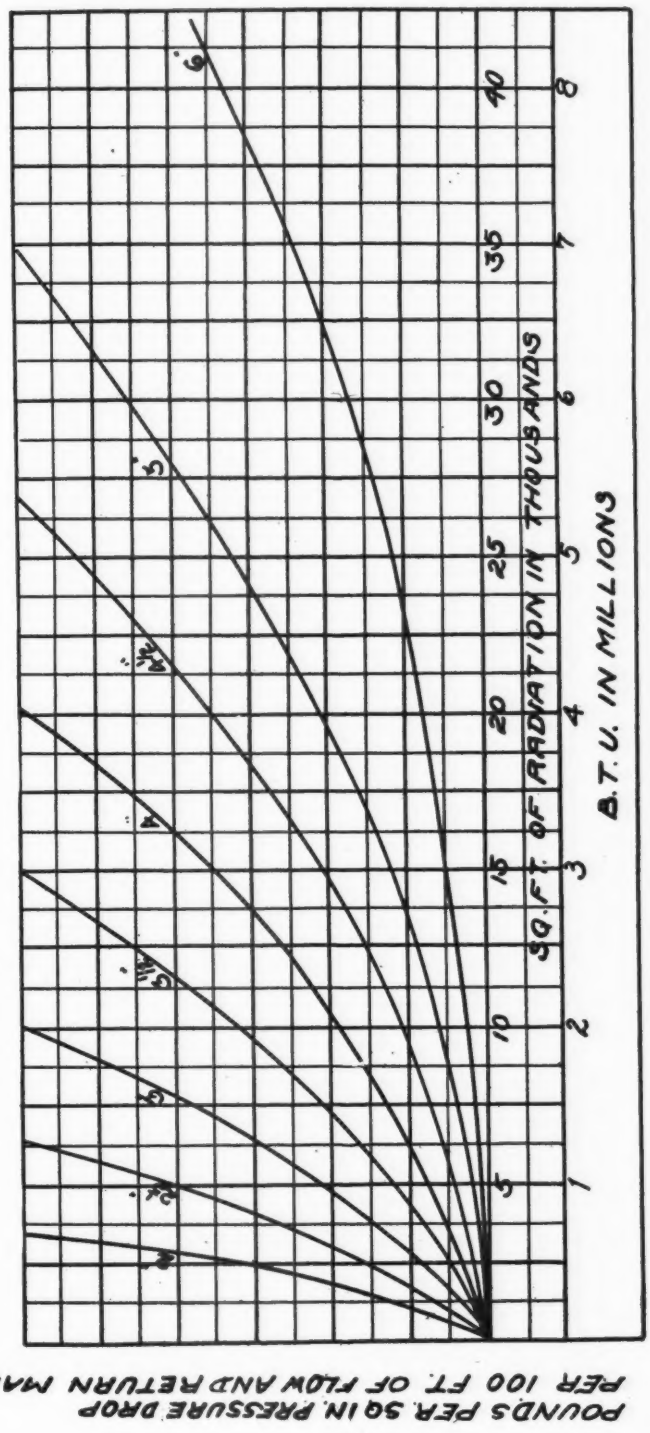
These figures show us that the 4½-in. line is the most economical line to install, but how our line pressures will be affected is important and must be taken into consideration.

The 4-in. line will give us a pressure drop in our differential pressure of 17.5 lbs.

The 4½-in. line will give us a drop of 10 lbs.
The 5 -in. line will give us a drop of 5.2 lbs.
The 6 -in. line will give us a drop of 2.5 lbs.

Therefore, if this line is to be connected at a point of large differential, as at a point near the station, we can afford to run the 4½-in. pipe, but, if we are to connect it at a point of low differential, as at the end of the system, the 5-in. would be the better size to install and it might be economy to install the 6-in. line.

From the above calculations on combined losses of steam and water a few conclusions can be deduced:


POUNDS PER SQ IN PRESSURE DROP PER 100 FT OF FLOW AND RETURN MAINS
B.T.U. IN MILLIONS
SQ. FT. OF RADIATION IN THOUSANDS
CONNECTED LOAD IN SQ. FT OF RADIATION OR B.T.U.

PRESSURE DROP IN HOT WATER MAINS, 2-IN. TO 6-IN., BOTH INCLUSIVE.

Based on 1 Square Foot of Radiation Emitting 200 B. T. U. per Hour.

FIRST: In steam pipe lines the radiation loss is much more important than the friction loss.

SECOND: In water pipe lines the friction loss is decidedly more than in steam pipe lines, but still it is not as large as the radiation loss.

The heat we lose from friction is not lost in the pipe line, with a small exception, due to the fact that it tends to increase the temperature of the line and its contents and thus increase the radiation loss. Where we lose this heat is at the station, due to the increased pressure that is necessary to properly circulate the heating medium, whether it be steam or water. This is proven by the fact that if we circulate water fast enough in a small system we can eventually raise the temperature of the water in the system a considerable amount. In this case we obtain the heat from the circulating pump and transmit it to the water through the friction in the piping.

Another general conclusion we can deduct is that the less our friction loss, the less our pipe line loss in a given size line, for the radiation loss remains constant.

As can be readily comprehended, in every pipe line system we have a very nice problem to figure on and one that requires study and thought.

Of the two losses, that from friction and that from radiation, the radiation loss is much the greater and from the above formulas we can tell how much can be lost or saved in the pipe line insulation and construction.

Knowing the cost of 1000 lbs. of steam in a steam plant or the cost per 1,000,000 B.T.U. in a water plant, it is easy to figure how much can be spent on insulation to reduce the factor "C."

For example: Assume our pipe line loss to be 0.05 lbs. per square foot per hour.

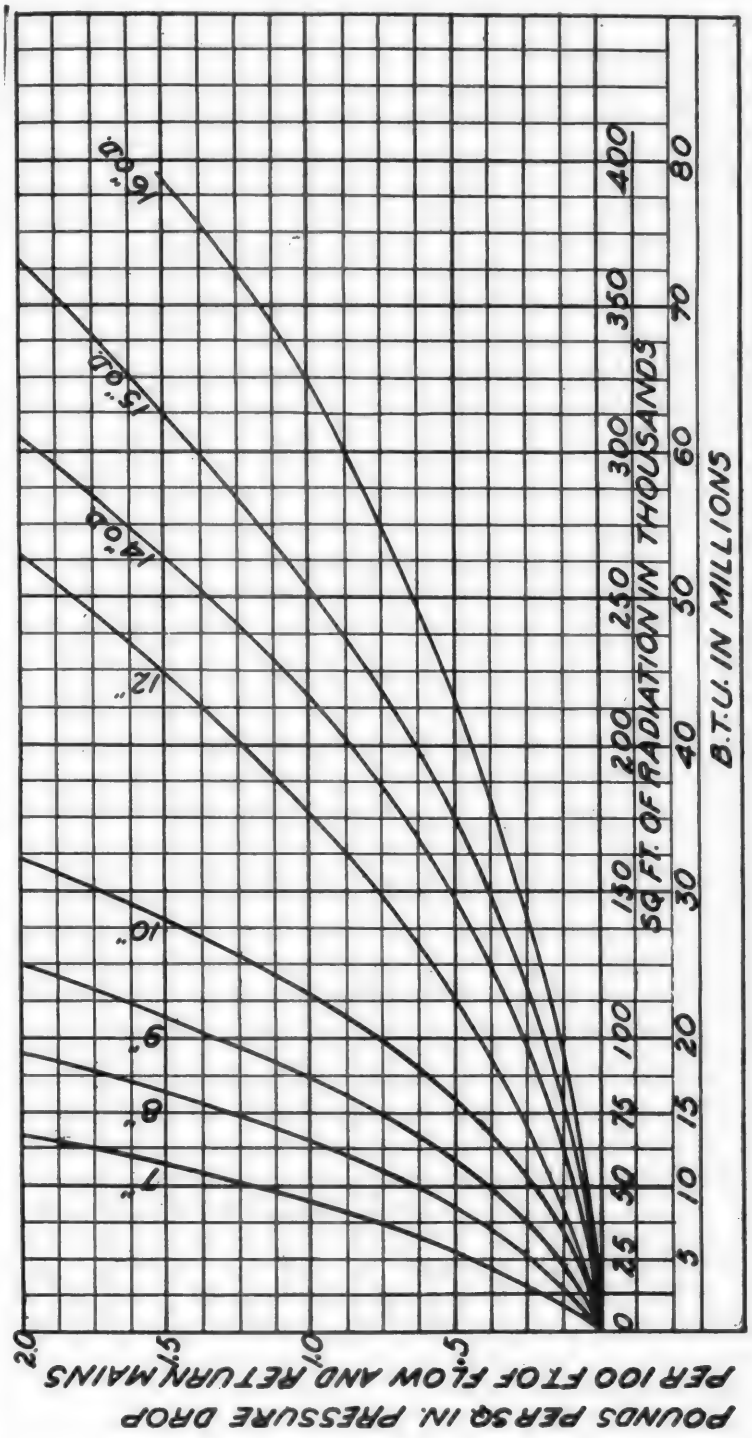
Assume 1000 lbs. steam costs to generate 25c.

Steam per square foot per hour for 5200 hrs. $=$ 5200 $\times$ 0.05 $=$ 260 lbs. steam per season $=$ 6.5c.

With a pipe line loss of 0.04 lbs. steam per square foot per hour, for 5200 hours we would have a charge 5.2c. or a saving of 1.3c. per season per square foot of pipe line surface for every 1/100 lbs. of steam saved.

Assume a pipe line with 60,000 sq. ft. of surface; 1/100 lbs. of steam saved by increasing our insulation would save us $780.00 per year or 10% on $7,800.00 or 10% on 13c. per square foot of surface, which would show a saving as follows on the various sized lines:

The following is a table showing the amount of money it would be profitable to spend each year to in-



PRESSURE DROP IN HOT WATER MAINS, 7-IN. TO 16-IN., BOTH INCLUSIVE.
Based on 1 Square Foot of Radiation Emitting 200 B. T. U. per Hour.

crease the insulating qualities of the pipe line so as to save 1/100 lb. of steam per hour per square foot.

Diameter of Line, in Inches.	Cents per Lineal Foot.
3	11.9
4	15.3
5	18.9
6	22.5
8	29.25
10	36.5
12	42.25
14 O.D.	47.64
16 O.D.	54.44
20 O.D.	61.57

From the above table we can figure how much more one insulation is worth than another and also how much we can afford to spend to increase the insulating qualities of our pipe line system.

For example: A 16-in. steam line, covered with wood boxing, badly rotted (C = 0.10) is costing us about three times too much to operate and we could afford to spend to bring our line loss to 0.04 (6 × 54.44c.) = $3.27 per foot per year. If we repair this insulation or replace it with new so that it will last 10 years, we could afford to spend $32.70 per foot to do it. This shows how valuable and essential, efficient and durable insulation is.

As pipe line losses from radiation are by far the greatest loss in central station heating, it is at this place where we can afford to look for leaks and can afford to fix them. The operating manager who is overlooking this point is blind to his own interests.

Summer Meeting of British Heating Engineers

An attendance of 63 members and guests marked the mid-summer meeting of the Institution of Heating and Ventilating Engineers, at Chester, England, July 3-5. The professional sessions were held at the Grosvenor Hotel, with the president, O. M. Row, presiding. Forty-three new members and associates were elected at the meeting, in addition to a number of transfers from associate to full membership.

The papers read were as follows:

"Some Doubtful Points in Gravity Hot Water Heating," by E. R. Dolby, of London.

"Characteristics of the Propeller Fan," by Oswald Scott, of Birmingham.

"Saving in Electricity by Applying the Reck 'Mixing' System to Hot Water Heating Apparatus Worked by Electrically-driven Pumps," by Capt. A. B. Reck, of Copenhagen.

The next meeting of the institute will be held in London, October 17, 1911, at the Institution of Mechanical Engineers.

One of the most interesting features of the entertainment programme, which included a variety of excursions and other diversions, was the annual banquet at which a toast was proposed by P. M. Krebs to The American Society of Heating and Ventilating Engineers. The toast, which was enthusiastically received, was responded to by Walter Yates and Charles R. Honiball, members of the American Society.

The usual group photograph was taken on the lawn of the Northwestern Hotel at Llandudno, whither the party had proceeded as the guests of President and Mrs. O. M. Row.

Superheated Steam in Heating Work

By W. E. Dowd, Jr.

Heating engineers interested in the uses of superheated steam have been recently favored with an elucidation of the subject from the point of view of present-day practice, as contained in a paper presented at the recent annual meeting of the National District Heating Association in Pittsburg. The animated discussion following the reading of the paper showed not only the keen interest in the subject felt by engineers generally, but also by the growing use of superheated steam in heating work. The principal portion of Mr. Dowd's paper are presented herewith:

The steam superheater is one of the most interesting developments that has resulted from modern power plant requirements. It is interesting because it is the only auxiliary apparatus used in the boiler room which decidedly affects the quality of the steam generated. In the last fifty years, many improvements have been made in boilers and their appurtenances. The water tube boiler replaces the fire tube and not only occupies less floor space, but allows greater steam pressures to be carried. The mechanical stoker, with forced draft, permits the burning of more coal and has improved the combustion. The economizer, which is really a primarily boiler, has increased the economy and capacity of steam generating by the utilization of the heat in the waste gases.

While these advantages have result-in increased capacities and greater economies, none of them has had any effect on the plant outside of the boiler room. The superheater, however, not only affects the economy and capacity of the steam generator proper, but offers decided advantages in the transmission and consumption of steam for all purposes.

TWO CLASSES OF SUPERHEATERS

Before taking up the advantages of superheated steam we will investigate the methods adopted to generate it. The many types of successful superheaters may be divided into two general classes. First the attached type, in which the superheating tubes are installed inside the boiler setting; and second the separately fired type in which the superheating surface is operated by an independent furnace.

Both of these types have their offices and a combination of them is often found beneficial. Broadly speaking, the attached type of superheater should be used where a moderate degree of superheat only is desired, and where the duty is comparatively constant. The superheater installed in the boiler setting has the advantage of requiring no extra floor space, nor attention beyond that given the boiler proper, and is automatic in its operation in that the desired temperature will be obtained under practically all operating conditions.

The separately fired superheater may be used where high temperatures are desired, or where requirements demand only the superheating of a portion of the steam, or where superheated steam is only desired at certain periods of the plant's operation. Having its individual setting and furnace this superheater may be operated independently of the boilers, and its capacity is very elastic. The combination of these two types of superheaters would naturally result from a combination of the requirements which each best fulfills and we find many plants in which the boilers are all equipped with attached superheaters and certain departments also employ a separately fired superheater.

WHERE SUPERHEATED STEAM IS USED TO ADVANTAGE

Having established the two general methods of obtaining superheated steam, we may now investigate the advantages of its use. Superheat may be defined as heat added to steam without increasing its pressure, or heat imparting to the steam a higher temperature than that shown in the steam tables. This additional heat is of advantage in two distinct fields.

The first, where steam is used expansively in power plant work where the prevention of condensation effects an increased economy; and second, where steam is used for heating in process work, under which conditions the increased calorific value is of benefit.

But, in either case, the prevention of condensation in transmission from the stop valve in the boiler room to the point of consumption is an important item. Even in the best plants, with short mains and the best forms of insulation, this loss is noticeable, but where necessity demands long transmission lines, the use of superheat cannot be too strongly recommended. By its adoption smaller pipes may be used without increasing the loss in pressure; operation may be resumed in much shorter time after a period of inactivity; the expense of separators, traps and return drains may be eliminated; and the advantage of dry steam at the point of consumption may be obtained.

Data has been accumulated which gives us the loss in temperature for the transmission of superheated steam through various sizes and lengths of piping, and specialists in this department of thermo-dynamics can estimate the amount of superheat necessary for transmission under any given condition.

SUPERHEATED STEAM PREVENTS CONDENSATION IN ENGINES

In the engine, whether it be of the reciprocating or rotary type, the benefit of superheat is due to the prevention of condensation. Tests run on pumps and engines, horizontal or vertical, simple or compound, condensing or non-condensing, prove that this increased economy will range from 1% to 3% net steam saving for each 10° of superheat at the throttles; this means that 150° superheat at the throttle of a simple direct acting pump would reduce its steam consumption by 50%. In a high speed, jacketed, compound, condensing engine, or steam turbine, the saving would be 15% net steam, due to 150° superheat.

These two cases are the extremes in point of saving due to superheat. In the former, the condensation of the steam forms a large percentage of the loss and the increased economy is, therefore, very great; in the latter, condensation of steam has been largely eliminated through other sources and the saving due to superheat is, therefore, not so great.

Although authorities differed in the past as to the proper amount of superheat, the best engineering practice to-day favors the use of a total temperature of 500° F. at the throttles of the engine room equipment. This would represent a superheat of 175° at 100 lbs. pressure, and 125° at 200 lbs. Such a temperature, if held constant, would not be injurious to even the oldest types of valve mechanism, nor would it interfere with cylinder lubrication. This moderate temperature could also be used on all the auxiliaries of the plant and the piping thus simplified.

IN PROCESS WORK ADVANTAGE LIES IN INCREASED CALORIFIC VALUE

In the process or heating service, the advantage of superheat is due to its increased calorific value. There is hardly a field of heating by steam in which the advanced exponents have not found superheat to be beneficial. Superheated steam is now being used on kettles, dryers and stills whether they be equipped with exterior jackets, or interior coils or heated by direct admission of steam; an economy either in decreased cost of heating, or in increased capacity of the machine has been effected in every case, and it is under this heating service that the small separately fired superheater has met its greatest commercial success.

For heating, the use of superheated steam is either beneficial in permitting a high temperature to be obtained without carrying extremely high pressures, or its use husbands the valuable latent heat in the steam until it may be employed at the point of consumption; and we find the use of superheat under such conditions to affect a saving of from 25% increased capacity to 5% decreased steam consumption.

This service, however, covers such a wide field that specific conditions must be cited before an intelligent estimate of the benefits of superheat may be made, and the proper amount of superheat determined.

Temperatures as high as 1000° F. have been obtained without injury to the superheater, but this point should be considered the ultimate capacity for practical service. It must, however, be remembered that superheat should not be used for heating such products as would be injured by high temperatures.

TYPICAL CASE WHERE BOTH TYPES OF SUPERHEATERS ARE USED

Having outlined the two methods of obtaining superheat, and the two services under which it is of advantage, it is believed that the combination of these conditions will prove of particular interest. We will consider a power plant using either water or fire-tube boilers, the steam from which operates cross compound, non-condensing engines and the exhaust from which, in turn, is used for heating. We find under these conditions both types of superheaters may be of benefit for both services. The installation of the attached form of superheaters in the boilers to add 150° of superheat to the steam generated by them would prevent all condensation in the steam admitted to the throttles of the engines and a given horsepower would be obtained with a saving of from 15% to 18% of the steam. This steam saving, as has been stated above, results from the prevention of condensation both before and after the point of cut-off in the cylinder. The moisture in the exhaust from this engine, therefore, will be reduced by exactly the same amount. We therefore see that the calorific value of this exhaust is not reduced by the decreased consumption in the cylinder. This is a most important point and is often overlooked. However, when it is considered that nearly three-quarters of the heating value of steam is due to its latent heat, and that this latent heat has been lost in every pound of moisture condensed, the merit of the statement will be apparent.

If this exhaust steam is to be used at some distance from the engine, it would be advisable to pass it through a separately fired superheater, located near the engine outlet, of such capacity as to add 1° of superheat for each 10 ft. of the best type of transmission main. Thus, if a building were to be heated 500 ft. from the engine room, 50° should be added to insure dry steam at the point of consumption, if the main well covered and designed for a velocity of 5000 ft. per minute; if a slower speed than this obtains, a proportionately higher superheat should be added. If, instead of heating a building, the steam is to be used for process work in which a high temperature would be of advantage, an additional 150° or 200° could be well added to the temperature but this additional superheat is unnecessary for imparting temperatures under 100° F. The installation of these two superheaters would not only save an appreciable percentage of the initial steam, but would offer a much higher heating agent at the point of ultimate consumption.

COST OF SUPERHEATED STEAM

In contemplating the advantages of superheated steam, however, we must not forget the cost of obtaining it. Considering the specific heat of superheated steam to be 0.5, the addition of 150° to saturated steam at 150 lbs. pressure would theoretically require 7½% increase in total fuel consumption. This actual figure, however, is only reached where the temperature is added in a separately fired superheater. In this apparatus stack, radiation and ash pit losses are encountered and the efficiency of the unit will only be about 70%. The installation of the superheating surface in the boiler setting, however, is apt to improve the boiler efficiency, as the tubes, to some extent, absorb waste heat from the furnace gases, and we find that where superheaters are attached to uneconomical boilers the added temperature is acquired with no fuel cost, and, where more efficient

boilers are in use, the combination with superheating tubes will improve the evaporation by from 1% to 3%. In other words 7½% additional calorific value may be added to the steam by increasing the fuel consumption from nothing to 6½%. However, this increased calorific value, as has been noted above, will effect a steam saving of from 50% to 15% and thus we find the net fuel saving due to superheat of 150° in power plant operation to be from 8½% to 50%, depending on the type of boilers and prime movers operated, and it is conservative to state that the average benefit due to 150° superheat would be 15% net fuel saving.

This increased economy of the plant, however, should be considered in connection with the hours of annual operation at capacity. Irrespective of the type of machinery in use, the load factor under which the plant operates should dictate the advisability of installating superheaters. Although equipments have been purchased which paid for themselves in coal saving each year, such satisfactory results cannot generally be expected.

Superheaters should be favorably considered if their use would effect a net interest on investment of 10% above depreciation and maintenance charges. This earning capacity would be obtained in a plant of practically any size which operates at one-third of its capacity and burns coal costing $2 per ton, or over.

In considering the use of superheated steam in this article, only well designed and properly constructed superheaters have been considered; for although the best apparatus will give very satisfactory results, a bad or cheap superheater would prove worse than useless on account of the troubles it would cause. A large proportion of the earlier articles written on superheated steam was devoted to explaining the troubles reported from its use. To-day, however, superheat needs no such defense.

A thorough investigation of all the unsatisfactory installations proved them to suffer from the common fault of excessive temperatures. This was caused either by faulty design, or bad construction of the superheating surface. A momentarily high temperature is fully as injurious to engines or turbines as a constant application of great heat.

The best authorities now disapprove of operating a plant under normal conditions, at a higher temperature than 600° F., and the best superheaters have demonstrated their ability to deliver steam at the temperature for which they were designed without fluctuations. It is this advance in the study of the art that is responsible for the rapidly increasing popularity of the superheater and its resultant enormous list of installations which is now reported to aggregate nearly 2,000,000 H.P., in this country.

Some Doubtful Points in Gravity Hot Water Heating

Figuring a hot water gravity system according to the various methods recommended by such well-known authorities as Charles Hood (England), William J. Baldwin and Prof. R. C. Carpenter (United States) and H. Reitschel (Germany) the author of a paper read at a recent meeting of the Institution (British) of Heating and Ventilating Engineers, showed that there are wide differences between the results obtained by using these methods.

The author, Ernest R. Dolby, assumed, for instance, a water column 40 ft. high with the temperature of the flow 200° F. and the temperature of the return 160° F. The results for this particular case, he found, would give heads as follows: Hood, 6.838

in.; Baldwin, 6.708 in.; Carpenter, 3.6 in.; Reitschel, 6.71 in. All agree fairly closely in this instance, except Professor Carpenter, the head given by his method being only about 53% of the average value of the other three.

Proceeding, the author referred to a simple type of hot water heating system in which the water leaves the top of the boiler at a temperature of 200° F. and returns to the boiler at 160° F. It becomes merely necessary then to decide what is the height of the column of water in question.

This particular point, the author states, does not seem to be clear to many persons engaged in the heating business and he gives it as his opinion that the only satisfactory method is to take the centre of gravity of the boiler and the centre of gravity of the radiator and measure the vertical height between the two points. The question then is, what effective head is present in the system which will cause the circulation of the water?

Hood's theory, as given by the author, is that the proper method to adopt is to consider the two columns of water as at an initial temperature of 39° F., and then to discover by how much the length of each column would expand if heated to the temperature assumed above, and to deduct the height of one column from the other, and call this difference the head available to overcome all the frictional resistances encountered in the system.

The author observed that the sole reason for desiring to discover the effective head is so that by using certain tables or formulæ concerning the flow of water in pipes, it may be possible to decide what is, for this particular case, the most suitable size of pipe to adopt. He also calls attention to the fact that in ordinary hydraulic work all the tables used have been calculated from experiments made upon pipes in which water at a temperature of, say, 40° to 50° F. was flowing and that, in most cases, this temperature would be practically constant. It seems, therefore, that in considering a heating circulation, a temperature must be assumed which is the mean of the temperatures existing in the various parts of the system. This, in the case under consideration, would be $(200° + 160°) \div 2 = 180°$ F.

The author shows that by Hood's method an effective head may be found and expressed in terms of water at 200 F., but applied to a body of water of an average temperature of 180° F. He concludes, therefore, that Hood's figure should be reduced.

Baldwin's method of calculating is precisely that recommended by Hood, but he uses tables of expansion which are slightly different. Professor Carpenter, however, gives a very different method. He considers that the two columns of water at different densities may be compared to two weights connected by a weightless cord passing around a frictionless pulley.

Mr. Dolby refers to a table of velocities which Professor Carpenter calculates would be produced in pipes, supposing they were frictionless. The author states that, for practical purposes, such a table appears to be useless and states his belief that Carpenter's effective head formula is only applicable, if at all, to the moment when the circulation is about to start.

The author favors Reitschel's formula:

$$h \times \frac{\frac{y'' - y'}{y' - y''}}{2} = \text{effective head}$$

where h = the height of the water column in feet, y'' the specific gravity of the water in the return pipe, and y' the specific gravity of the water in the flow pipe. Although this formula gives an available head precisely double that found by Professor Carpenter's method, the author states that it is not so easy as it might appear to discover which is more nearly accurate, the factors including a correct estimate of the frictional resistance of the internal surface of the pipes used, the enormous variation in the carrying capacity of a given size of pipe, produced by a variation in the state of the surface of that pipe; also the dimnunition in the viscosity of water as the temperature increases.

FLOW OF WATER IN SYSTEM

Passing to the volume of water necessary to be carried through each portion of the system, the author assumed that the preliminary estimates for the design of a hot-water heating system have been made, and it is now desired to know what is the head absorbed by friction in each portion of the system, and then taking the sum of the heads, to compare this sum with the available head obtained by previous calculations. Should the sum of these heads absorbed by friction be greater than the available head, it will show clearly that an adequate flow in the system could not be maintained, and some portion or the whole of the pipes will have to be made of larger diameter, while, if the two were equal, it would prove the assumed pipe sizes to be suitable.

The author then shows that the formulæ for the flow of water give as great discrepancies as in the calculation of the available head, largely due to the fact that most of the data available were obtained from tests at low velocities with cold water on mains of various diameters, but usually above 2 in.

The author assumes a simple case, to show these discrepancies, in which the heads are required to cause a flow of water at velocities of 1 ft., 1.5 ft., 2 ft., or 2.5 ft. per second through a straight length of 100 ft. or clean cast-iron pipe 3 in. internal diameter.

Five different authorities are quoted, including Reitschel and Carpenter and the figures run from 0.194 to 0.5 ft. to produce a velocity of 1 ft. per second; from 0.437 to 1.15 to produce a velocity of 1.5 ft.; from 0.65 to 1.98 for a velocity of 2 ft.; and from 1.21 to 3 for a velocity of 2.5 ft. per second. The lowest figures, in each instance, are those of either Reitschel or Carpenter or both. The author calls attention to the fact that in any ordinary building the velocity attained with gravity circulation will not exceed 1 ft. per second, and, in most cases, it will be considerably less. He favors the higher figures given above for gravity circulation and the lower heads for reinforced circulation. The author also holds that the same formula will not hold good for all the velocities found in practice, there being a point at which a formula applicable for the lower velocities ceases to be correct and the same way with the high velocity formulæ. In this connection he quotes Professor Unwin's statement that the resistance to the flow of water through a given pipe is 25% less if the water be at 160° F., than if the water be at 57° F.

Heating and Ventilating Two School Buildings from a Central Plant

By Samuel R. Lewis

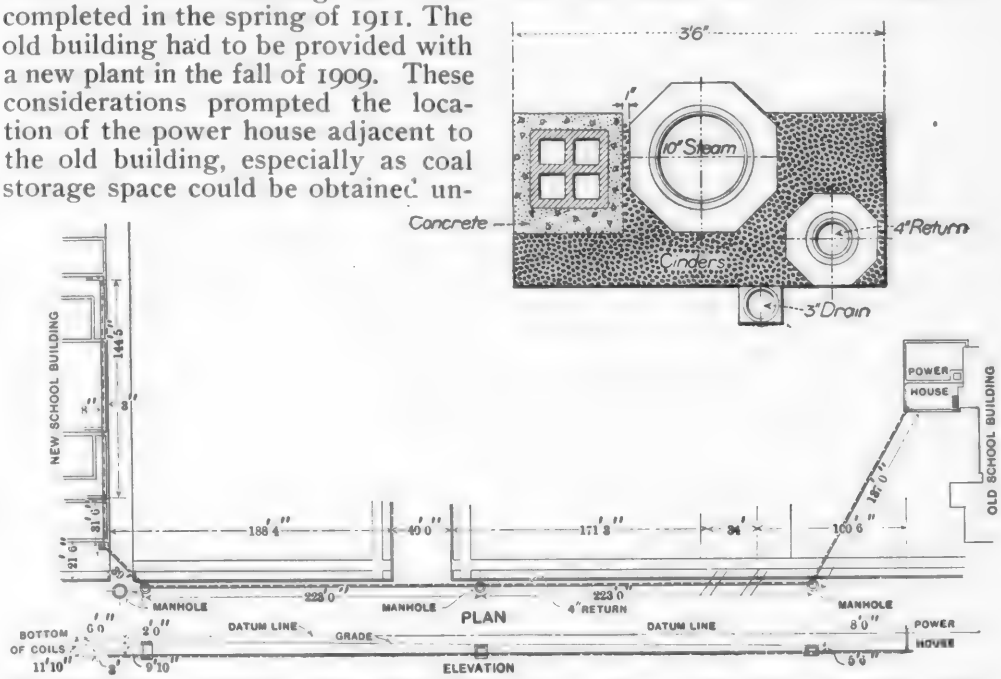
The construction of a new school building in Decatur, Ill., at a point not far from a similar building in which the heating and ventilating apparatus was to be remodeled, led the school authorities to decide upon a central heating plant from which electric light and steam for power and heating purposes could be supplied to both schools.

The work presented many interesting features which were described in detail by Samuel R. Lewis in a paper presented at the recent semi-annual meeting of the American Society of Heating and Ventilating Engineers in Chicago.

The new building is about 500 ft. distant from the old building, which was formerly heated, Mr. Lewis, stated, by ten warm air furnaces. The ground space for the new building and its surroundings made it desirable to eliminate from it any boiler plant, and the fact that the furnaces in the old building were worn out at the time of the designing of the new building rendered it

necessary to install new heating and ventilating apparatus there.

The old building is of non-fireproof construction, hence it was proper to remove all fire from within it. The new building was to be completed in the spring of 1911. The old building had to be provided with a new plant in the fall of 1909. These considerations prompted the location of the power house adjacent to the old building, especially as coal storage space could be obtained under it, and it would be possible to provide enough capacity to handle the old building through the winter at minimum cost.



UNDERGROUND CONDUIT FOR SUPPLYING HEAT AND ELECTRICITY TO THE NEW SCHOOL BUILDING

It was planned to provide the most efficient and economical type of apparatus known, with ventilation of all rooms up to at least 30 cu. ft. of air per minute per pupil, with new sanitary apparatus, all of the ventilated type, and power for fan propulsion, lighting and manual training machinery in both buildings. Steam, return and electric conduits were permitted under the streets by special arrangement with the city.

ADVANTAGES OF INDIRECT HEATING

It was decided to install the indirect type of heating, well governed by automatic regulation, as being the most positive and sanitary, as well as economical. Prominent advantages of this system are:

1. It is ordinarily difficult or impossible to hold school without running the fans and securing ventilation.

2. The pupils in a given room are all subjected to the same temperature and some are not overheated, as they must be when direct radiators are placed in the rooms.

3. The trouble and noise of air valves and steam and water circulation in the radiators are eliminated.

4. The false air circulation by direct radiators destroying diffusion of the fresh air is eliminated.

5. The all-indirect plants are found to be more economical of fuel.

COST OF HEATING SCHOOLS IN CHICAGO AND KANSAS CITY

The following data may be of interest:

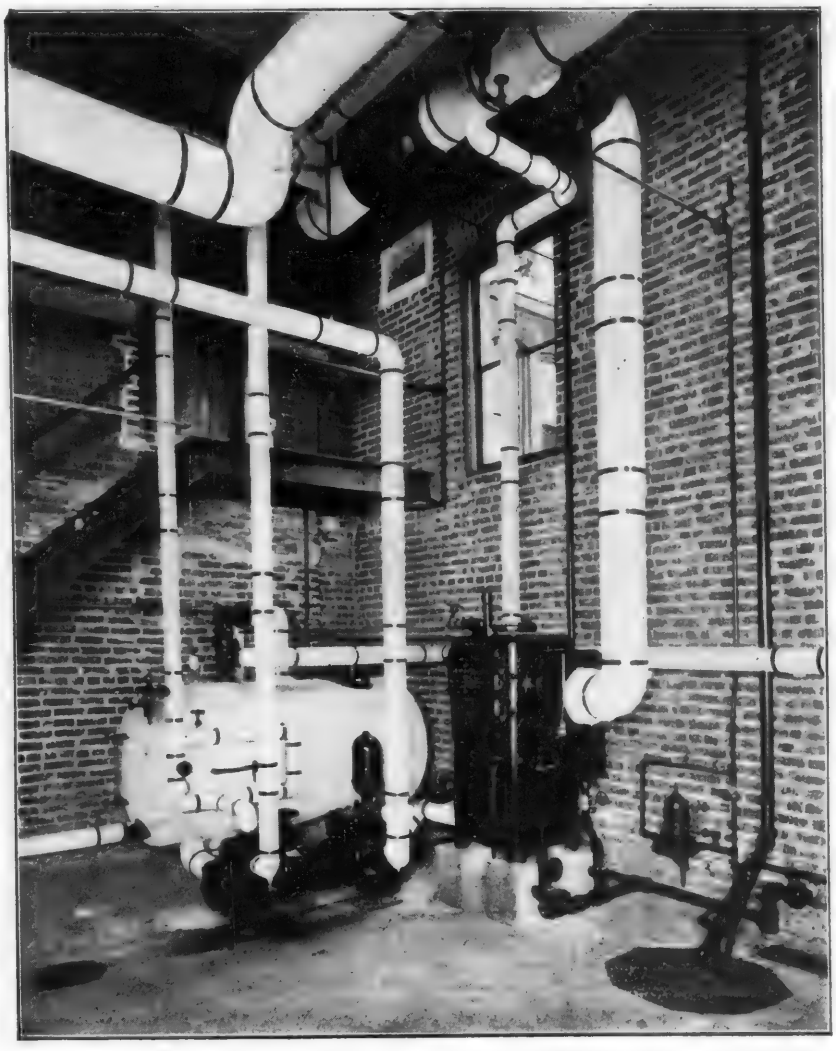
Chicago: Five schools, with both indirect and direct heating, all of about the same size, averaged, per cubic foot of space heated and ventilated per season, 1.11 lb. of coal. Five other schools of approximately the same size, burning the same kind of coal in the same sort of boilers but having indirect heating, averaged, per

cubit foot of space heated and ventilated per season, only 0.67 lb. of coal.

Kansas City: The Manual Training High School, having both indirect and direct heating, cost in fuel, for the year 1909-10, per cubic foot of space heated and ventilated, 0.273 cents. The Westport High School, having entirely indirect heating, cost in fuel for the same year, per cubic foot of space heated and ventilated, 0.124 cents. Both buildings burn oil in similar boilers.

DIRECT RADIATION INCLUDED IN EQUIPMENT OF DECATUR SCHOOLS

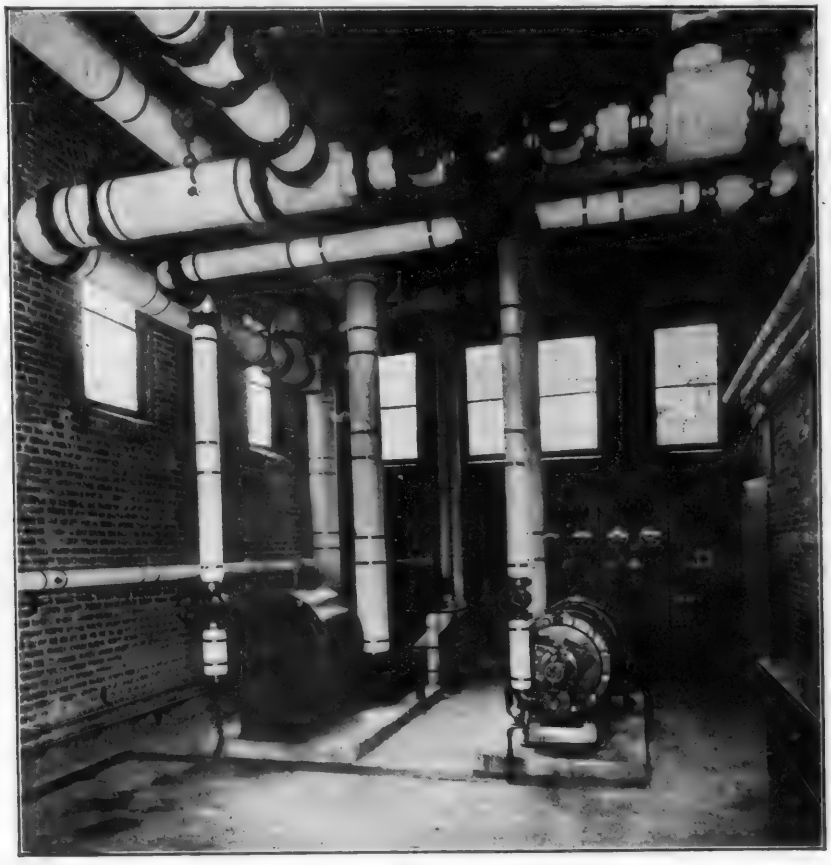
In the Decautur plant direct radiation is used in all toilets, offices, corridors or rooms with plumbing which might be injured by excessive cold. The advantage of having direct radiation in class rooms is that it tends to keep them warm when the fans are not in operation, provided they are furnished with steam. At Decatur the buildings were arranged in such a manner that it was possible to group the indirect radiation in small chambers near the



AUXILIARY APPARATUS AND PIPING IN POWER HOUSE

banks of flues, and thus by gravity air circulation keep the rooms reasonably warm without any direct radiation when the fans were not in operation. This has proved in practice to work out with remarkable success.

and one of 75 K.W., the other of 50 K.W capacity. Together they have ample power to carry all of the lights and power in both buildings at one time. In actual practice, however, the peak load never has overtaxed the smaller machine.

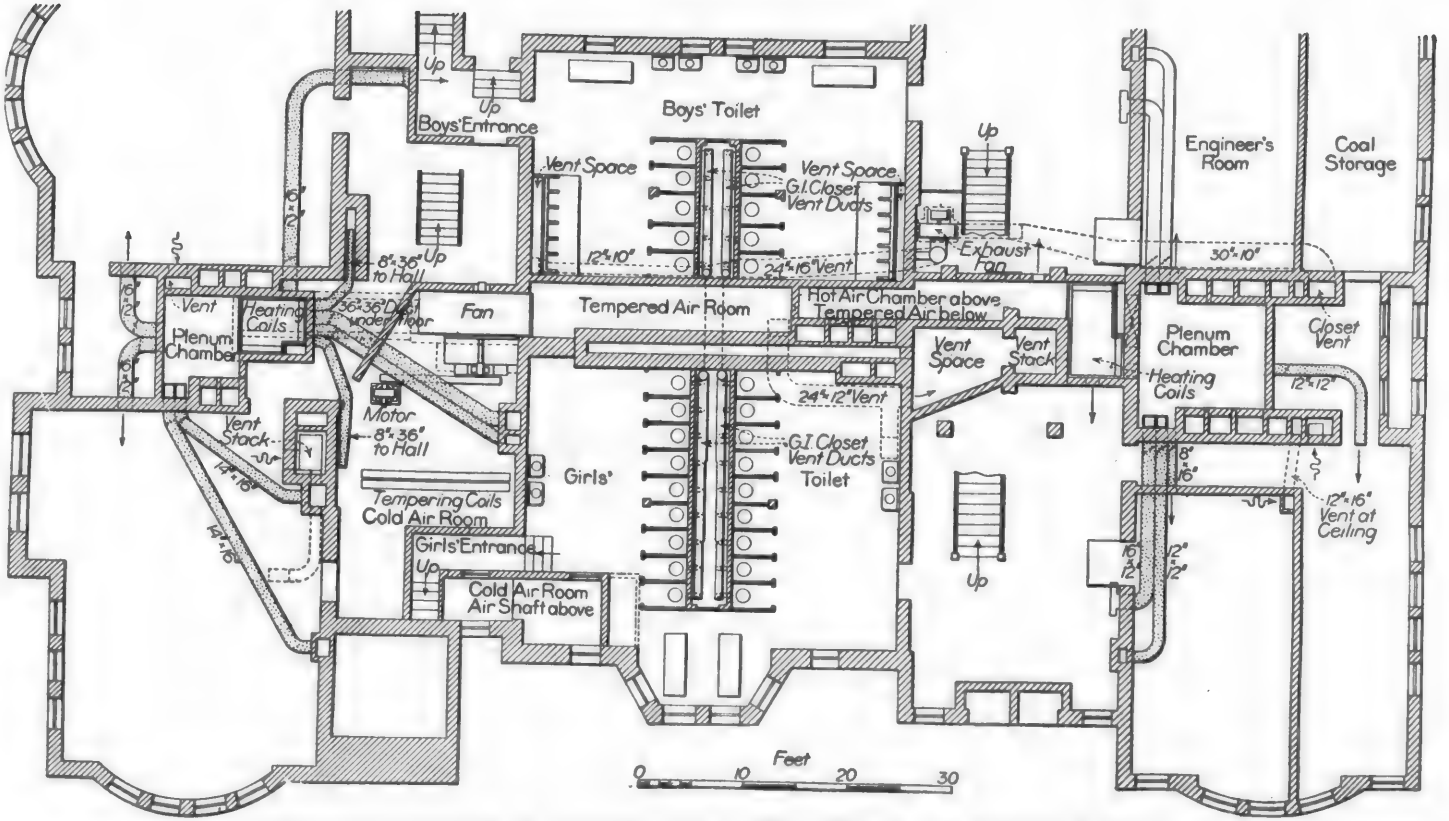


STEAM TURBINES AND PIPING IN THE SCHOOL POWER HOUSE

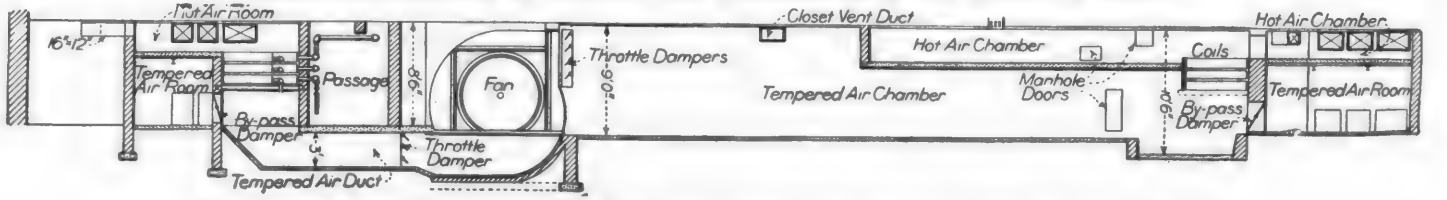
EQUIPMENT OF POWER PLANT

The boiler house is a fireproof building, containing three high-pressure horizontal tubular boilers of 450 rated horsepower, with stand- and equipment for bituminous coal. In a room adjoining the boilers are located the feed-water heater, boiler feed pumps, all main operating valves, pressure regulator, etc., and two horizontal turbine-generators, with the accompanying switchboards. The distribution lines for steam, compressed air and electricity center in this room. The generators are for 250-volt direct current,

It is admitted that the turbines are not as economical of steam as would be reciprocating engines, but the fact that the plant is in service practically at no time when heat also is not required, and that, therefore, the electricity is practically a by-product disposes of this argument. The turbines are practically noiseless, have a very long life, require no internal lubrication, thus relieving the boilers of oil, and they occupy very little space. The feed water heater is of only 150 H.P., being used merely to purify the make-up water, or to supply one boiler



REMODELED SCHEME OF HEATING AND VENTILATING IN OLD SCHOOL BUILDING



SECTIONAL ELEVATION THROUGH THE REMODELED HEATING AND VENTILATING PLANT

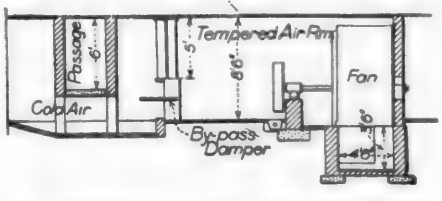
when exhausting to the atmosphere in warm weather, when the plant might be in operation for power or lighting.

STEAM MAINS

To the old building are run a 7-in. steam line and a 2½-in. wet return. To the new building in a common trench, running about 650 ft. and from 4 to 12 ft. underground, are carried a 10-in. steam and a 4-in. wet return, in tin-lined Wykoff insulation, and a four-part vitrified tile electric conduit, as shown. The main to the new building pitches upward from boiler house, and as it is below the receiver, the condensation in it is raised to the receiver by a tilting trap. Proper expansion joints and anchorages are inserted, the former accessible in brick manholes.

EQUIPMENT OF OLD BUILDING

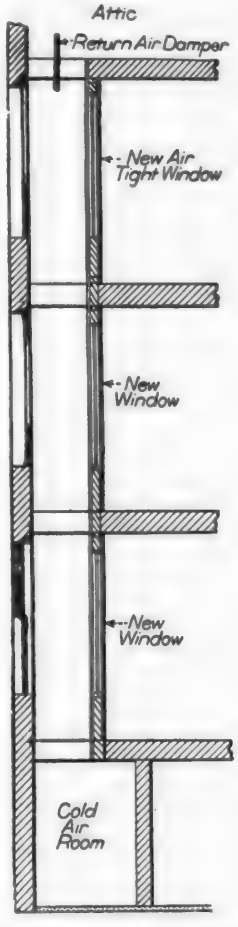
In the old high school the supply fan is a special Sirocco wheel driven by a belted 15-H.P. motor, delivering tempered air to horizontally placed reheating coils in plenum chambers directly at the bases of the flues. Fresh air is drawn from the second-story level. All toilet rooms have special closets, with large rear local vent openings, and all urinals are locally vented, being connected by metal ducts with an exhaust fan, which is driven by a direct connect-



AIR PASSAGE TO FAN, OLD BUILDING

ed 2½-H.P. motor. New flues of tile supplement the old flues and in the attic are placed cut-off dampers in all vent flues for shutting off the ventilation when the building is not occupied. This is effected by compressed air from the engine room.

All class rooms have automatic temperature regulation, the thermostats gradually moving mixing dampers in the plenum chambers without curtailing the volume of air, merely changing its temperature as required. Cumulative devices are installed, by means of which the power of the entire plant finally goes

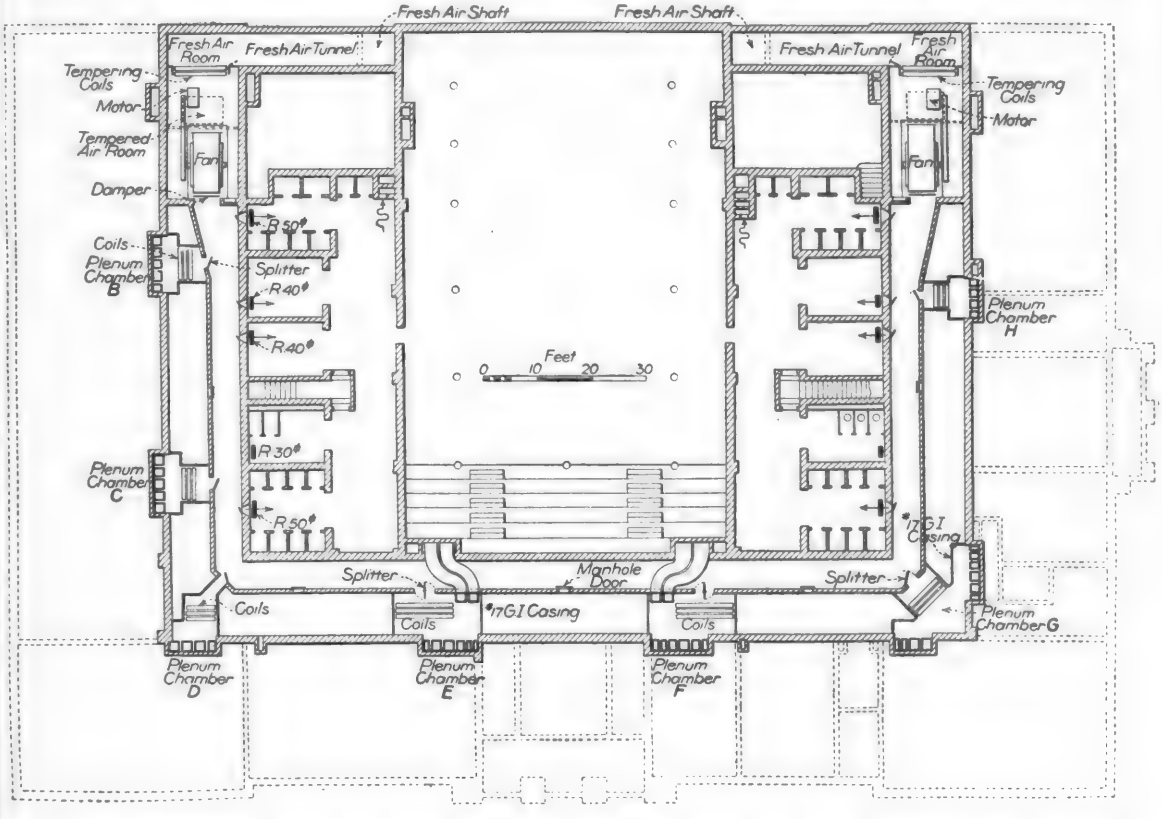


AIR INTAKE, OLD BUILDING

to the slowest room to reach 70° F. when warming the building in the morning. On all side wall air supply openings are placed adjustable diffusers, by which the air current may be deflected to any part of each room. There are no vent screens or registers in the new building, the ventilation outlets being finished as far as visible like the rooms, and thus they are swept out every day, preventing the unsightly accumulation of dust, chalk and paper common when screens are used.

The old school building has an air delivery of 43,000 cu. ft. of air per minute, and about 3,600 sq. ft. of in-

direct radiation. The air blown into the corridors finds its way out through the toilet rooms, through the locally vented fixtures, and thus there is always a greater air pressure in the former than in the latter, effectually preventing odors from the toilets anywhere in the building.



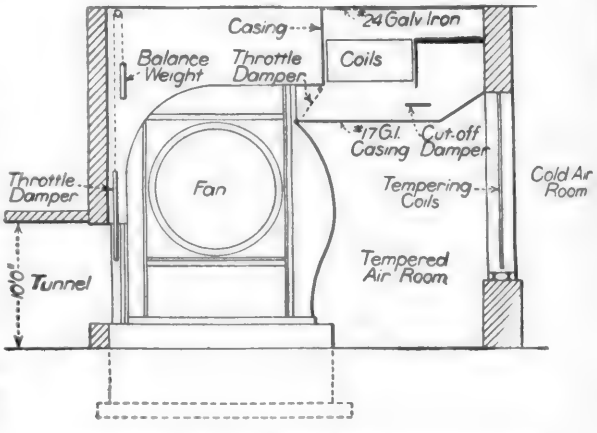
BASEMENT PLAN OF NEW BUILDING SHOWING HEATING AND VENTILATION SCHEME

for easy inspection, and can be flushed out with a hose. It is well lighted with electricity. It will be noticed that there is very little use of metal duct work. By closing the doors to the various other coils the auditorium or gymnasium may be ventilated or heated by either fan,

The toilet ventilation is entirely separate from the room ventilation.

EQUIPMENT OF NEW BUILDING

The new high school was naturally an easier and more symmetrical problem, but the description of the apparatus in the old building will very nearly suffice for the new one. The fresh air is drawn from the second floor level, tempered and delivered by the fans into a tunnel which extends under the center of the corridor, around three sides of the building. In this tunnel are nine groups of reheating coils and all of the piping for steam and condensa-

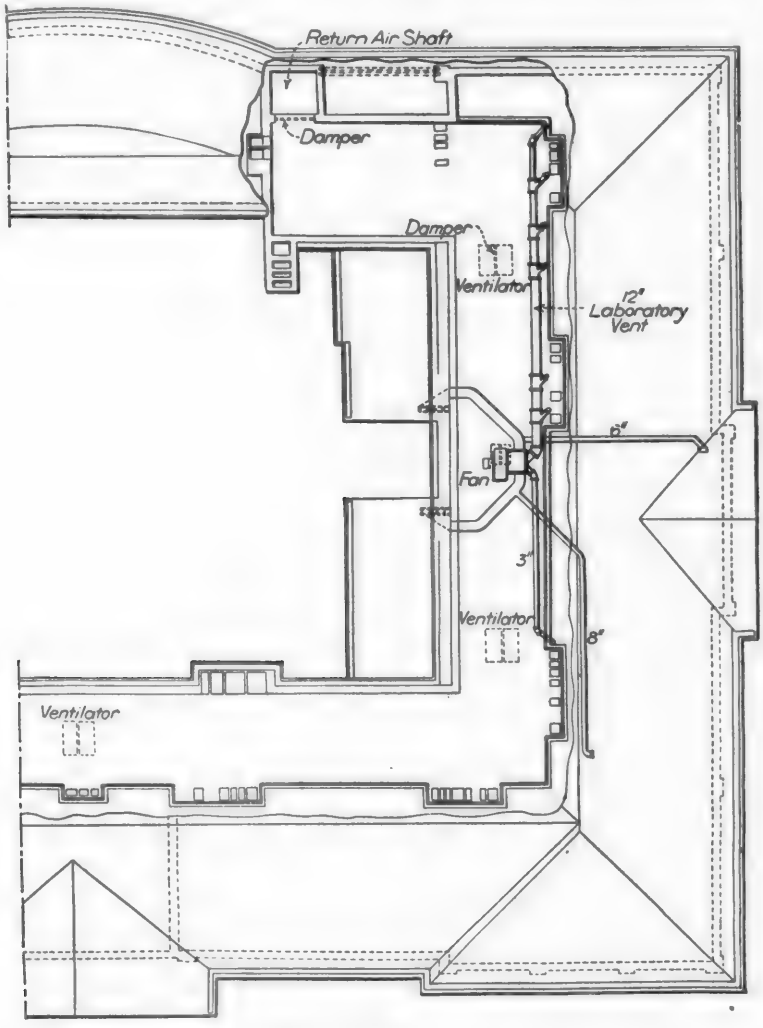


FAN ROOM DETAIL, NEW SCHOOL BUILDING

tion. The tunnel is of ample size without affecting the balance of the building. The supply fans are Sirocco wheels in double discharge housings propelled by 20 H.P. belted motors. The building receives 120,000 cu. ft. of air per minute, and there are about 9,000 sq. ft. of indirect radiation.

cial corrosion resisting construction. A large, tight foul-air chamber is formed in the roof space, from which the foul air escapes through ventilators, equipped with compressed-air controlled dampers as described for the old building.

In both the old and new buildings the foul-air chambers in the attic



EXHAUST AND RETURN CIRCULATION IN NEW BUILDING

Exhaust fans for toilet and chemical table ventilation are placed in the attic. Together they have a capacity of 150,000 cu. ft. air per minute and have 8 H.P. in motors. The chemical laboratory ventilation is carried in vitrified tile pipes, and the fan which handles the fumes is of spe-

may be thrown in connection with the fresh-air intake flues, thus forming a closed circuit, through which the air may be recirculated over and over positively, and a substantial fuel saving is thus effected when warming the building prior to occupancy.

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WITHIN the past month two of the largest manufacturers of heating apparatus have inaugurated the publication of so-called house organs which, from the character of their reading matter, might properly be described in more ambitious terms. Judging from the initial issues of these publications, this step cannot fail to be helpful to the trade in disseminating more widely knowledge of good heating practice. At the same time, it emphasizes an important trend among manufacturers everywhere in the way of enlarging their functions as advisers, not only of the public, but of the trade as well. This has seemed to many to be the logical course of events. With their unrivalled facilities for investigating the various theories and other problems that arise in the profession, the manufacturers have always been in a position to instruct the trade. This was illustrated in a striking way in a recent discussion of the practice of free engineering when the remark was made that it is not so long since engineers would not undertake to specify vacuum heating installations, and even fan systems, without first securing the guarantee of the manufacturers as to the correctness of their design, as well as their successful operation.

It seems more than possible that the modern type of house organ is to be the key to the question involved in the subject of free engineering. With the growing realization that engineering secrets are becoming out of place, it is fair to assume that the house organ will be an important channel through which the manufacturers will impart their discoveries to the trade.

THE final steps in the organization of the Institute of Operating Engineers deserve more than passing notice among heating engineers. The trade is becoming more and more concerned over the operation and care of heating and ventilating apparatus and the testimony of all indicates the necessity of a better-trained operating force. In this connection, the institute has developed a scheme of co-operation with the public schools by suggesting courses of instruction designed to increase the efficiency of operating engineers generally and to establish close relations between the school, the shop and the power plant. In this way it is proposed to make the certificate of membership in the institute a document of practical value, while the various grades of membership established by the institute are expected to furnish the incentive to promote proficiency.

Legal Decisions

Guaranty of Steam Heating Plant

In an action to foreclose a mechanic's lien for material and labor, the defense was that the plaintiff took the contract to install a steam-heating apparatus in the defendant's apartment house and guaranteed that the same would heat the house to a certain temperature; that the plaintiff did install the heating plant; that the defendant had paid the full contract price therefor; that the apparatus failed to heat the house, as provided in the contract of guaranty; and that the plaintiff furnished the materials and did the work for which the lien was claimed for the purpose of making good the guaranty. The guaranty read: "When the apparatus herein proposed is finished in accordance with the above specifications, I guarantee that it will heat all rooms and halls in which radiators are set to a temperature of 70° F. in the coldest weather."

The plant was installed and the contract price paid, and thereafter the defendant requested the plaintiff to install the pump for which the lien was claimed. From the testimony it appeared that it was impossible to heat the rooms in the building with the original apparatus in cold weather. The defendant company's president testified that it worked properly when it was first tested, but that in cold weather in some of the radiators one coil would heat and the balance remain cold, and in others only two or three of the coils would heat, and that the temperature was far below 70°; that it was so cold that the tenants threatened to leave and some of them did move out. He also testified that he called the attention of the plaintiff to the matter, and called in another steam heating man to examine it, and that upon such examination it developed that the discharge pipes were trapped, so that the cold water in the radiators could not be forced out, and that, if an exhaust pump was put in to exhaust the water from the discharge pipes, it would heat satisfactorily; that something had to be done right away, and that he told the plaintiff to put in the pump; that when the pump was put in and started, it pumped the water out of the discharge pipes and the heating apparatus worked properly, heated all the coils in the radiator, and heated the entire building, in compliance with the contract. There did not appear to have been much discussion between the parties on the subject, but it appeared that the plaintiff gave the defendant a catalogue containing a description of the pumps; that the defendant examined this catalogue and told him to send for and install this particular pump, and that there was nothing said at that time about who should pay for it.

The court held that the plaintiff could not recover. Had the defendant insisted upon having the defect remedied in some particular way, as by the installment of this pump, and it had failed to remedy the defect, it might have been held responsible for choosing an unreasonable method. But no attempt was made to show that the remedy was not a reasonable one, or, in fact, that it was not the cheapest and best remedy available. The conditions of the guaranty had not been complied with, it was the duty of the plaintiff to make good his contract, and it had been made good by the installment of the pump.

Yundt vs. Schultz-Degginger Co., Wasington Supreme Court, 113 Pac. 760.

Governor Dix Vetoes Bill for Separate Bidding on Heating and Plumbing Work

Due largely to the efforts of the New York State Association of Master Plumbers, a law was recently passed by the New York State Legislature to take effect September 1, providing for separate bidding on heating, ventilating, plumbing and gas fitting of State, county and municipal buildings. The measure, however, was vetoed by Governor Dix on the ground that it would involve increased expense to the State.

The bill, which is known as the Senate bill, introduced by Senator T. D. Sullivan, of New York, amends Section 1, Article 5 of Chapter 29 of the laws of 1909, by adding the following new section:

Section 88. Separate specifications for certain contract work. Every officer, board, department, commission, or commissions, charged with the duty of preparing specifications or awarding or entering into contracts for the erection, construction or alteration of buildings in any county, or city, or the borough of any city, when the entire cost of such work shall exceed $1,000, must have prepared separate specifications for each of the following branches of the work to be performed: 1. Plumbing and gas-fitting. 2. Steam-heating, hot-water heating and ventilating apparatus. Such specifications must be drawn so as to permit separate and independent bidding upon each of the classes of work enumerated in aforesaid subdivisions; and all contracts hereafter awarded must conform to this requirement by being separately awarded, it being provided that the firms or corporations shall be responsible and reliable. The authorities in charge of any county or municipal building, however, will as at present be permitted to have such work done as may be deemed advisable by their regular employees, or in the case of public institutions, by the inmates thereof.

Section 2. Article 2 of Chapter 58 of the laws of 1909, entitled "An act relating to state finance, constituting Chapter 56 of the consolidated laws," is hereby also amended by adding at the end thereof a new section, No. 50, to read as follows:

Section 50. Separate specifications for contract work for the state. Every officer, board, department, commission or commissions charged with the duty of preparing specifications or entering into, or awarding contracts for the erection, construction or alteration of buildings for the state, when the entire cost of such work shall exceed $1,000, must have prepared separate specifications for each of the following branches of work to be performed: 1. Plumbing and gas-fitting. 2. Steam-heating, hot-water heating and ventilating apparatus. As in the case of counties and municipalities, it is likewise provided that said contracts shall be let out to separate and responsible bidders, except that the authorities of public buildings as hereinbefore noted shall have the power to have work in such institutions done by the regular employees, or the inmates as the case may be.

Current Heating and Ventilating Literature

Under this heading is published each month an idex of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

BLOWERS

A New Design of Blower for Increased Efficiency. A. H. Anderson. Illustrates and describes a new construction for air blowers, claiming better results than the older designs. 2000 w. Eng News.—May 11, 1911. 20c.

SHOP HEATING

Heat Calculations in Factory Heating. H. C. Russell. Hints on systems of air distribution, and calculations for blower work. 1200 w. Met Work—May 27, 1911. Serial. 1st part. 20c.

VENTILATION

Ventilation Equipment Hotel Sherman. Illustrates and describes details of heating and ventilation, including automatic temperature regulation, air purifying and cooling, in a 12-story building in Chicago. 2200 w. Metal Work—May 13, 1900. No. 23295.

Heating and Ventilating the Yarrow Home. An account of a series of interesting experiments showing that air outlets sometimes become inlets, and the results in spreading an epidemic. 200 w. Sci Am Sup—May 27, 1911. 20c.

Death of James Mackay

James Mackay, vice-president and secretary of the Kellogg-Mackay Co., Chicago, died at his home in Chicago, July 18, of typhoid-pneumonia. He had been ill but a few weeks and his condition was not thought to be serious until within a week of his death. He was unable to be present at the recent mid-summer meeting of the American Society of Heating and Ventilating Engineers in Chicago, and a resolution of sympathy and good wishes for his recovery was passed at that time. Funeral services according to Masonic rites were held at his home in Chicago and the body was then taken to Montreal for interment. Among those present at the funeral were his brothers, William M. Mackay, of New York, and Alexander Mackay, of Montreal; also his sister, Mrs. Robertson, of Montreal. Mr. Mackay is survived by a widow and one daughter. He also leaves five brothers and three sisters.

Few men in the heating industry were better known or were held in higher esteem by a host of acquaintances than Mr. Mackay. Possessed of a genial nature coupled with a rugged honesty of character inherited from his Scotch ancestry, Mr. Mackay early won the confidence of his associates and attained a prominence that led to a career of unusual success, both in commercial life and in other activities with which he was identified.

He was born in Montreal, Que., in 1853. He secured his early training in a heating and plumbing shop in that city. One of his first appointments was that of western manager of the boiler department of the Richardson & Boynton Co., of New York. Later he became Chicago manager for the American Boiler Co., where he was first associated with C. V. Kellogg. When this company was merged into the Kellogg-Mackay-Cameron Co., on January 1, 1898, Mr. Mackay was chosen vice-president and secretary. This position he held until his death, although the title of the company was later changed to the Kellogg-Mackay Co.

Mr. Mackay was a charter member of the American Society of Heating and Ventilating Engineers and held many important offices in that organization. He was elected president of the society in 1909 and also served as president of the society's Illinois Chapter.

He was also a member of the Central Supply Association, Illinois Athletic Club, St. Andrew's Society and was president of the City Jobbers' Credit Association in Chicago. As a Mason he was affiliated with the Rogers Park Lodge and Chapter of St. Bernard's Commandery.

Canada's Asbestos Supply

According to an official report, Canada produces 82% of the world's supply of asbestos. The companies operating asbestos quarries and factories in Canada are capitalized at $24,290,000. In 1880 only 380 tons of asbestos were produced in the Dominion, valued at $24,700; in 1909 the output was 63,300 tons, valued at $2,300,000. In 1909 2,000 men were employed in the asbestos industry, and received wages amounting to $1,350,000. In the Black Lake quarries, in the Province of Quebec, there are 45,000,000 tons of asbestos rock in sight. The Russians are the only real rivals as regards extent of asbestos resources, but are heavily handicapped by the excessive cost of transportation of $35 to $40 per ton from the Russian mines to London. Serious competition is not feared by the Canadian companies on this account.

A Home-Made Hygrometer

Directions for making a simple, yet fairly accurate, type of hygrometer are given by E. R. Pritchard, secretary of the Chicago Department of Health, as follows:

Cobalt chloride	5 drams
Sodium chloride 150	grains
Calcium chloride 40	grains
Gum arabic 80	grains
Water 2	ounces

Dissolve carefully, and then soak thin white muslin in the solution and wring dry; when dry, cut into strips for use and hang up in rooms where indications are desired. The muslin strips when dry are blue; when moist they are pink or red. If the air in your room contains 70% relative humidity, the muslin indicator, prepared as directed, would show pink. If there be only 60% or less, the color will be blue. If the strip assumes a greyish color, inclining to pink, it would indicate a relative humidity ranging from 60% to 70%.

New Office Building for the H. W. Johns-Manville Co.

The accompanying photograph shows the new 12-story office building being erected at 41st street and Madison avenue, New York, for the H. W. Johns-Manville Co., who will occupy it in its entirety about May 1, 1912, as the general offices and New York salesrooms of the concern.

The large windows on the lower stories will be of bronze, and the vestibule and entrance hall of Italian marble. The entire ground floor will be devoted to the retail department.

There will be a mezzanine gallery with bronze rails and a marble stairway, with bronze railing, leading up from the first to the second floor. Each floor will be devoted to one or more departments. The executive offices will occupy the eleventh floor, while the twelfth floor will be used as a sample and exhibition room.

The building will be known as the "Johns-Manville Building," and will have the unique distinction of being one of the few 12-story structures to be entirely occupied by a manufacturing concern for office purposes only.

The building will be of fire-proof steel construction throughout, and will

NEW JOHNS-MANVILLE BUILDING, NEW YORK

contain two Otis passenger elevators of the latest type. Each floor will have an area of 2,500 sq. ft., or a total area for the twelve floors and basement, which will extend under the sidewalks, of 34,500 sq. ft.

An unusual feature connected with this building will be the fact that the tenant manufactures and will furnish a considerable part of the equipment of the structure, such as J-M asbestos roofing, asbestos plaster, linolite system of lighting, J-M conduit for wiring, flushometers, J-M sanitor seats, electrical accessories, waterproofing, Keystone hair insulator, asbestos wood, fire extinguishers, asbesto-sponge felted and asbestocel pipe coverings.

Including the space to be afforded in the new general offices, the H. W. Johns-Manville Co., at the present time, occupies in all of its various branches, offices and factories, 2,657,160 sq. ft. of floor space, or about 61 acres.

The 5,000 employees of the company would in themselves form a good-sized little city. Included in this array of employees are 406 salesmen. In addition, the company has extensive European offices.

National District Heating Association

President A. D. Spencer has appointed the following committees which were provided for at the association's recent convention in Pittsburg:

STATION RECORDS

E. J. Kiefer, So. Bethlehem, Pa., and F. R. Wetherell, Peoria, Ill.

RATES

R. D. DeWolf, Rochester, N. Y., and J. L. Hecht, Chicago.

METERS

F. C. Chambers, Springfield, Ill.; George W. Wright, Baltimore; D. S. Boyden, Boston; and C. H. Spiehler, Dayton, O.

MEMBERSHIP

A. C. Rogers, Toledo, O.; Warren Partridge, Springfield, Ill.; Charles R. Bishop, Lockport, N. Y.; Byron T. Gifford, Chicago; E. B. Tyler, Pittsburg; C. E. Evans, Jr., Pittsburg; Frank K. Chew, New York; J. E. Bordley, Detroit, Mich.; E. C. Richardson, Providence, R. I.; E. J. Kiefer, So. Bethlehem, Pa.; and W. J. Kline, Lockport, N. Y.

The address of D. L. Gaskill, secretary of the association, is at Greenville, O.

For An Association Emblem

A design for an association emblem is being prepared by George W. Wright, of Baltimore, and R. D. DeWolf, of Rochester, N. Y., for use on stationery, as well as on association buttons.

Institute of Operating Engineers

The first annual convention of the Institute of Operating Engineers will be held in New York, September 1-3, 1911, at the Engineering Societies Building, 29 West 39th street, New York. The business will include the adoption of a constitution, by-laws, educational requirements, apprenticeship requirements, regular study courses, list of books, etc.

New Book

Drying Machinery and Practice, a handbook on the theory and practice of drying and desiccating, with a classified description of installations, machinery and apparatus, including also a glossary of technical terms and bibliography, is an exhaustive work from the pen of Thomas G. Marlow, an English specialist. The book is intended to give an insight into the art of drying and, with this end in view, the general principles which govern the various methods of removing moisture from all kinds of materials are stated, followed by a summary of the various methods employed, together with tables of calculations necessary to decide the requisite capacities. Many typical examples are presented, with adequate illustrations, of drying plants for drying a wide variety of materials. The author states that so vast a field of research was opened up in this connection, owing to the innumerable kinds of material to be dried, as well as the varying degree of dryness required, that it was found necessary to add a bibliography which contains references to the entire literature on any desired point.

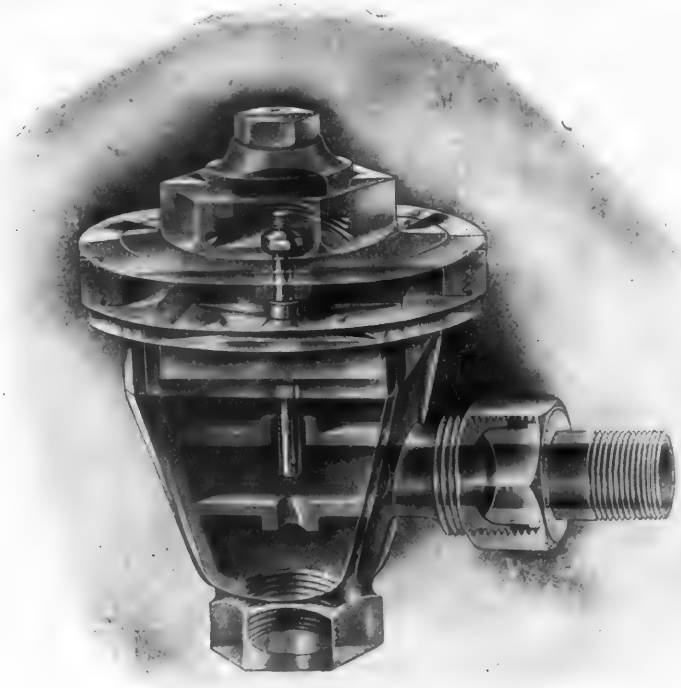
Although the book is devoted largely to English practice, American methods are drawn on extensively, and the fact that no one had written a book in either English, German or French on this subject makes Mr. Marlow's work of exceptional value to all engaged in this branch of engineering. It will surprise many to know the importance of drying machinery in so large a number of trades. The glossary of terms is particularly full and includes explanations of terms, units, symbols and formulæ. Size 6x9 in. Pp. 326. 174 illustrations and 22 tables. Published in New York by D. Van Nostrand & Co., 23 Murray street and 27 Warren street. Price, $5.00 net.

NEW DEVICES

The Kinealy Thermal Valve

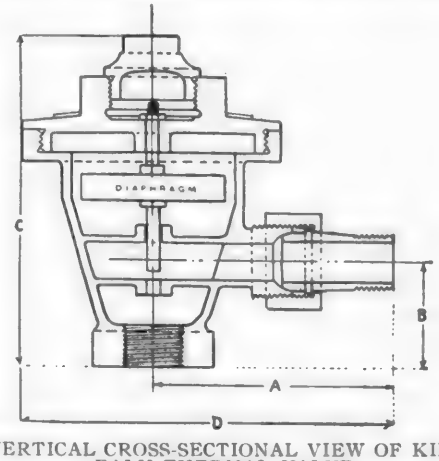
Interesting features of the Kinealy thermal valve for Kinealy vacuum and vapor heating systems are that it opens for water and air and closes against steam, is noiseless in operation and requires no jet water. It may be used on pressure systems, as well as on vacuum or vapor systems, and is designed to act equally well for all pressure in the radiator. The valve consists of a shell of substantially square cross section, having an inlet piece by which it is connected to the radiator, and an outlet piece by which it is connected to the return pipe. Inside of the shell there is a bellows of special design, made of two metal diaphragms, of a non-corrosive metal. The bellows contains a volatile liquid which vaporizes at a cer-

tain temperature and causes the bellows to expand and operate a valve piece which controls the flow of air and water from the radiator into the return pipe.



KINEALY THERMAL VALVE

The air and water pass from the radiator through the same or different orifices, but their flow is controlled by the action of the bellows. The diaphragms used in the bellows are the Kinealy type



VERTICAL CROSS-SECTIONAL VIEW OF KINEALY THERMAL VALVE

used in the Kinealy damper regulators and are susceptible of an unusually large movement.

The manufacturer guarantees that the valve, when properly applied and adjusted, will permit the escape of water and air on any pressure from vacuum to 25 lbs. above the atmosphere without adjusting. It is furnished in three sizes, including ½-in., supplying 250 sq. ft. of direct radiation and draining 75 lbs. of water per hour, ¾-in., supplying 750 sq. ft. and draining 225 lbs., and 1-in., supplying 1400 sq. ft. and draining 420 lbs.

The Kinealy thermal valve is manufactured and sold by the Kauffman Heating & Engineering Co., 2109 Olive street, St. Louis, Mo.

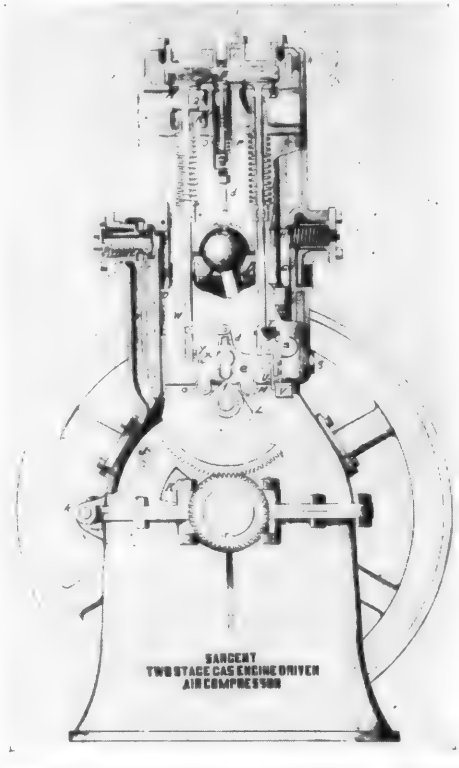
Sargent Two-Stage Gas-Driven Air Compressor

With the increasing demand for compressed air for industrial purposes and its economical compression in large or small quantities, there have been many improvements and refinements in compressors which have increased their efficiency and reliability, yet the thermal and volumetric efficiency of many air compressors is still too low.

To meet the demands for a self-contained, efficient, gas-driven air compressor the machine shown herewith has been brought out. It consists of a vertical gas engine with a differential trunk piston, the annular space around it being used for compressing the air. As there is but one piston, one connecting rod and

one crank shaft for both the gas engine and the compressor, the combined efficiency of the unit is correspondingly increased.

On the up stroke air is drawn into the crank case through the port K, when it registers with the corresponding port on the crank disc J. On the down stroke air is compressed in the crank case and flows through the valve E into the annular chamber made by the differential piston. On the return stroke this air is forced through the discharge valve H and outlet I to the storage tank or receiver, during which time the crank case



SARGENT TWO-STAGE GAS-ENGINE DRIVEN AIR COMPRESSOR

is again filled. On account of the large surface surrounded by cold water and the short distance the heat has to travel when generated in the annular space by compression, the thermal efficiency should be higher than in compressors having a small cooling surface per unit of volume.

The engine proper is of the four cycle type and as air is compressed every stroke the two fly-wheels and crank discs are made heavy to maintain a sufficiently uniform speed.

An inertia governor S, falling slower than the spring seated exhaust valve B, when the engine tends to run above normal speed, allows U to engage V, holding the exhaust valve open and the inlet valve stem W in such a position that X will miss Y and the inlet valve will remain closed. When the speed drops, U will miss V and the engine will resume its normal operation.

Either gas, gasoline or kerosene are used for fuel. When gas is used it is admitted through a graduated valve to the space R from which it flows to the explosion chamber C with the air when the collar Q on the admission valve stem rises. Gasoline or kerosene are taken in through a mixing valve on the air pipe.

Compressed air which the engine compresses is used from a storage tank for starting through the valve N, positively opened at the beginning of each working stroke as long as compressed air is turned on and the pressure is greater than in the explosion chamber. The crank pin is accessible through the hand hole plates, or the piston rod and crank may be adjusted or removed by turning back the cylinder on the hinge k. One sight-feed oil cup lubricates both ends of the piston, and superfluous oil gathered by the narrow groove in piston is delivered through diagonal holes to the ball and, passing half way round, flows through a hole in connecting rod to crank pin. The main bearings are lubricated by heavy grease, which also makes an effectual air seal. Ignition is by jump spark when the primary circuit is closed once in two revolutions by a pin on secondary gear.

Compressors of this type will compress air to 200 lbs. gauge or to any lower pressure at which unloader is set.

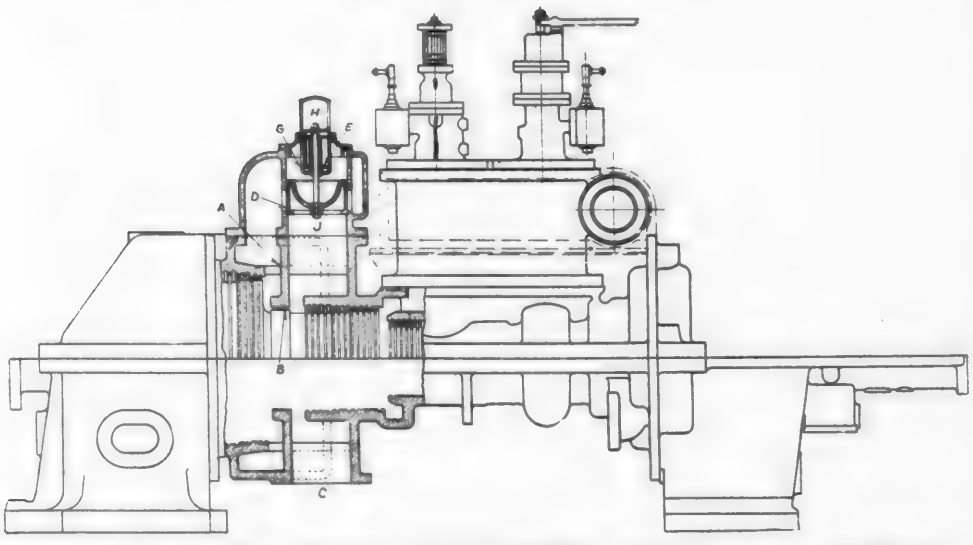
One can control both admission and exhaust, and the valve motion is stated to be quiet, positive and so proportioned that it will run continuously for months without adjustment. These compressors are made in four sizes to compress 9 to 150 cu. ft. of free air per minute. They were designed by C. E. Sargent, M. E., 136 West Lake St., Chicago, Ill.

An Automatic Bleeder Turbine

Being of direct interest to the members of the National District Heating Association, the Westinghouse Machine Company, of Pittsburg, Pa., exhibited, during the inspection trip of this association to their works on June 7, 1911, the detail features of one of its new developments in steam turbine design, known as the automatic bleeder turbine.

Its principal advantages result from always using the steam economically before diverting it into the heating system, while at the same time its construction makes it possible to automatically supply large quantities of atmospheric or low pressure steam for central distribution of industrial applications without affecting its electrical output.

A diagrammatic sectional detail is shown



ARRANGEMENT OF STEAM TURBINE WITH BLEEDER CONNECTION AND CONSTANT PRESSURE VALVE

herewith and a description of its operation follows. Generally, the design of the bleeder turbine closely resembles the standard Westinghouse single flow construction. The division wall (A) is introduced and strip packing provided at (B), forming a labyrinth with no mechanical contact. Thus the steam leaving the intermediate stage may flow into the heating system through the nozzle (C) or else, with a reduced heating demand, a part of the steam passes through the valve (D) and performs work in the low-pressure section.

The automatic valve (D) is controlled by predetermined pressure in the heating system and the requisite balacing dead weight on the upper side (H). The piston (E), enclosed in an oil-filled chamber (G), is provided to dampen any sudden movement due to pressure fluctuations.

Thus, if the pressure in the heating system is fixed at 18 lbs. abs. and the pressure at the end of the intermediate section tends to rise, due to an increased turbine load, the valve opening will increase, by-passing a greater portion of the steam to the low-pressure stages. On the other hand, if the load decreases and the pressure at (J) falls, the valve opening will decrease until the pressure is again built up to 18 lbs.

The Westinghouse Machine Company is the patentee and manufacturer of this type of turbine.

A New Automatic Hot Water Regulator and Circulator

A device designed to accelerate the circulation of water in a hot water heating system, thus permitting smaller pipe sizes as well as to regulate the draft in the heater, has lately been placed on the market by the D. & T. Mfg. Co., St. Louis, Mo. The feature of the apparatus is the location of the expansion tank, with its mercury trap, in the basement instead of in the attic. Regulation of the boiler dampers is secured by the action of the water in the system alone, requiring no outside force or energy, the expansion and contraction of the water acting on a diaphragm which operates the dampers.

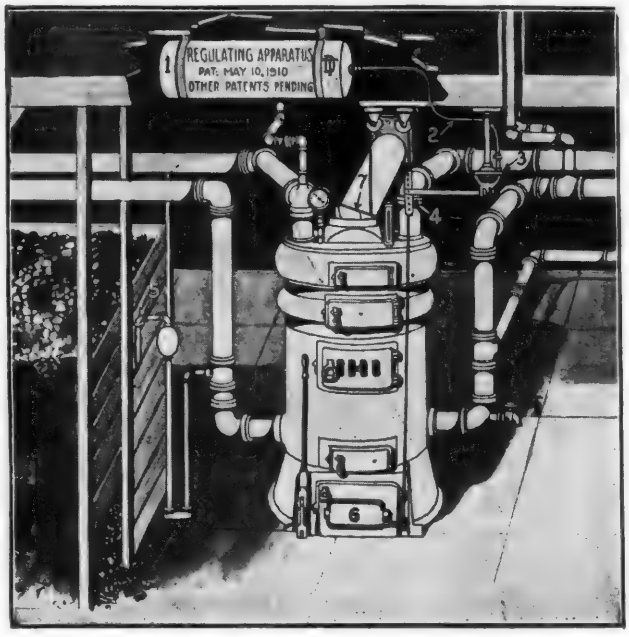
The general arrangement of the apparatus may be seen from the accompanying illustration. The tank shown is an air tank. It is connected to the top of the main flow pipe, near the boiler, by a 1-in. pipe. The relief trap is a column of mercury of sufficient height to hold back 10 lbs. over the altitude pressure and no more. It is connected to the return pipe at a point where sediment will not lodge.

The column of mercury is fixed for a predetermined pressure, above which the system will be relieved. The water being turned into the system, all the air below the tank is confined in the tank and diaphragm. When the system has become filled, the fire is started under the boiler. As the water becomes heated it expands and, the system being closed, having no open expansion tank at the top of the system, the expansion acts to displace the water and, as its only room for expansion is in the tank, the water compresses the air confined in the upper portion of the expansion tank and generates a pressure of approximately 1 lb. for every 20 increase in temperature.

As the pressure is generated, it passes through a lead tube and acts on the diaphragm, causing it to exert its power on a lever which controls the draft automatically. By raising or lowering a perforated plate on the end of the lever the

temperature of the water can be regulated with accuracy. In this way the device may be rendered responsive to the different temperatures required.

By using the device it is claimed that a fuel saving of 30% may be effected, while the increased circulation over a gravity system will run as high as 50%. The apparatus may be applied to a gravity hot water heating system and a new installation with these devices is said to cost no more than a gravity job.



D. & T. HOT WATER HEATING SYSTEM WITH EXPANSION TANK IN BASEMENT

The apparatus was invented by John M. Dougherty and Harry C. Tabler, whose initials form the company's title. A company was organized in 1909 and incorporated the following year with a capital stock of $30,000, and the following officers: President, John M. Dougherty; vice-president, James W. Gill; secretary and treasurer, Harry C. Tabler. All of the officers are men of long practical experience in the heating field.

Trade Literature

Webster Vacuum Heating System in the Boston City Hospital is the title of an attractive pamphlet, just published by Warren Webster & Co., Camden, N. J. It describes the installation, with the unusual obstacles to be met, of their "Hylo" or Type D system of heating in 26 buildings of this hospital. The pamphlet will be gladly sent on request, we understand, to interested parties.

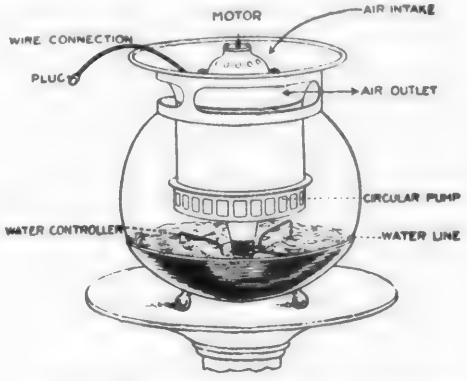
Common Sense Heating and Sanitary Plumbing, a catalogue of noteworthy artistic excellence, has been published by Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., and describes the company's line of steam and hot water heating apparatus and sanitary plumbing equipment. The publication is one designed especially for the house owner and contains many practical suggestions for the selection of suitable heating and plumbing apparatus. The illustrations include various types of the company's line of boilers, including the Spence and Modern for hot water, the Touraine for steam, and the American sectional steam and water boilers. A double-page view of the company's plant at Syracuse gives an idea of the size and capacity of this well-known house. Size 6x8½ in. Pp. 32.

Ideal Heating Journal is the title of a new house organ published by the American Radiator Co., Chicago. The publication is gotten up in a manner to reflect credit upon its publishers, both as to contents and presswork. For ten years the company has issued a monthly publication for intercommunication among its employees and the *Ideal Heating Journal* is the outgrowth of this publication. It is printed on a highly coated stock, with a cream-colored cover and has a special border design for the cover, featuring the "Ideal" trade mark. Included among the contents of the initial number, which is dated July, 1911, are articles, with illustrations, on the company's Institute of Thermal Research at Buffalo, "Wrong and Right Way of Buying Coal," "Vegetable Warehouse Heating," "Vento Heaters in School Warming," and an account of a sylphon packless radiator valve that held a vacuum of 27 in. for 30 days, besides a number of miscellaneous items such as descriptions, with illustrations, of the company's new wall radiator steady bracket, a new adjustable check damper, selecting proper tile linings for chimney flues, etc.

What $95 Did is told in a folder that is being sent by the Vapor-Vacuum Heating Co., 96 Drexel Building, Philadelphia, this amount being the cost of heating a four-story building with the Vapor-Vacuum heating system. The building in question is reproduced showing that it is exposed on all four sides. It occupies a plot 30x140 ft. and is four stories high. It contains 2700 sq. ft. of direct radiation, divided into 40 radiators. The manufacturer guarantees a saving of 25% on coal with the use of this system. Other features emphasized

are the absence of pounding in the pipes, in addition to the use of a vapor inlet valve by which the amount of heat admitted to each radiator may be controlled.

What Science Has Done for You is the title of a new folder describing the Duntley air cleaner and purifier, made by the Duntley Manufacturing Co., Chicago, Ill. The construction of this device may be seen from the accompanying illustration. It is designed to purify the air of dust, dirt and germs, as well as tobacco smoke and odors, although, according to experi-



DUNTLEY AIR CLEANER AND PURIFIER

ments, it has been found capable of reducing room temperatures from 69° to 60°, a reduction of 9°, within a few minutes. A further test, made by placing cracked ice in the reservoir of the purifier, showed a reduction of temperature to 55°, or a reduction of 14°. All of the experiments noted were made in an ordinary living room. The device is operated by a Burke universal electric motor, operated on either direct or alternating current.

A Foundry Heating System, describing the Green equipment for the plant of the Waterbury Castings Company, and Shop Heating and Ventilation, showing the systems used in the Abendroth & Root Mfg. Co.'s plant, are the titles of an interesting reprint which is being sent to those interested by the Green Fuel Economizer Co., Matteawan, N. Y. Special attention is called to the amount of glass surface in the foundry. This foundry is heated by hot air, so distributed that all of the smoke is driven upwards from the floor and removed, while the men are continually supplied with fresh air. The hot blast coils, in the two plants described, are all concentrated in one place and require practically no attention. By using a small amount of heat during the night the foundry is kept at such a temperature that there is no danger of moulds or cores freezing.

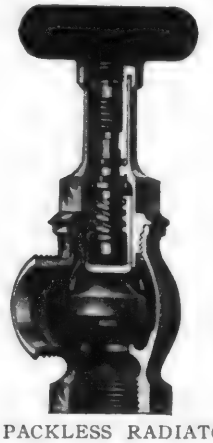
The pamphlet also describes a system of heating for a metal working shop in which the warm air is spread out evenly on the floor where it is wanted, instead of an attempt being made to blow it long distances, which always results unsatisfactorily.

Small Motors, for direct and alternating current, and Electric Dynamometers are titles of two of the latest bulletins issued by the Sprague Electric Works of the General Electric Co., New York. In the first-mentioned bulletin, the small power motors are described in detail, with views of the motors dissembled and also as applied for different purposes. In the second bulletin, the Sprague electric dynamometer, designed to measure the power generated by a gas engine, steam engine, turbine or motor, or the power required to drive any piece of apparatus, is discussed at length, the illustrations including an interesting electric dynamometer power curve with directions for its use. Size 8x10½ in. each. Pp. 16 each.

Catalogue and Price List No. 30 of the Chapman Valve Mfg. Co., Indian Orchard, Mass., is a notable publication of 174 pages, covering the company's line of valves, fire hydrants, indicator posts, sluice gates, shear gates, floor stands, etc. The company is known as the largest and oldest manufacturers of solid wedge gate valves in the country. The company guarantees its goods, the guarantee covering the replacement of defective goods. In addition to the usual details, including illustrations, price lists and dimensions of its various lines, the catalogue contains a full telegraphic cipher code. Special attention is called to the fact that the mixture of all cast iron used in the company's product is governed exclusively by chemical analysis. Sample pigs are taken from each carload received at its works and analyzed by a competent chemist. The coke used in melting is also analyzed. Size 6x9 in. (standard). Pp. 174.

Lavigne Packless Radiator Valves are the subject of an interesting circular issued by the Lavigne Mfg. Co., Detroit, Mich., in which are shown its various types of packless valves, as well as price list and dimensions of each type. In all cases of vacuum heating a good packless valve is stated to be an essential factor, as its use removes the most serious source of air leakage into the system. The Lavigne valve can be fully closed and locked closed by about three-fourths turn. It has a regular composition disc, enabling it to be closed absolutely tight. The stem of the Lavigne valve is of the non-rising type and is provided with a flange a short distance above the cam

thread. Between this flange and the inwardly extending flange of the bonnet is placed a specially prepared composition washer. Another similar washer is placed immediately above the inwardly extending flange of the bonnet, and upon this second composition washer rests a gland shaped follower plate extending from the handle. A shoulder is formed on the inside of this follower plate and



LAVIGNE PACKLESS RADIATOR VALVE

this shoulder supports a spring which bears upwards against a nut screwed to the top of the stem. A double service is performed by this spring, as it bears downwards on the upper composition washer, and at the same time pulls upwards against the lower composition washer, thus holding both of them tightly against the inwardly extending flange of the bonnet and taking up automatically any wear that may occur in either. This is designed to insure an absolutely tight joint against water, steam or air.

The lower end of the stem engages with a cage which is held from rotating by a set of trunnions which slide upwards and downwards in the tubular guides extending downward from the bonnet, so that the cage cannot oscillate from the action of the steam. To this cage the disc holder is attached in a swivel joint manner. The bonnet is carried clear up to the under side of the follower plate to prevent the possibility of injury or interference to the stem

The circular also describes the Lavigne graduated packless valve.

Radiation is the title of what is probably the most ambitious house organ that has appeared in the heating trade. It is published by the United States Radiator Corporation, Detroit, Mich., Vol. 1, No. 1 being dated July, 1911, and is to be issued occasionally under the editorship of George Albert Moore. Unlike most house organs, *Radiation* has a definite subscription price of $1.00 a year, or 10 cents for single copies, and a glance at its contents shows that the term "house organ" hardly applies to a publication of such an interesting character and one made up almost wholly of purely technical matter, the advertisements being practically the only indication that the periodical is allied to any particular concern. The contents include an article by Marion McLaughlin on "Setting the Sun to Work," being an account of the development of the solar heater; "Heating Buildings with Steam," by Roufis St. John, a serial article, the first installment taking up direct systems of heating, one pipe and other systems of piping; a brief account of the heating plant in the Ritz-Carlton Hotel, New York; "The Story of the Match," by George Ethelbert Walsh, illustrating primitive methods of fire-making; and "Fuel and Draft," by James J. Cosgrove, another serial, the first installment including some valuable coal classifications. The publication is of standard magazine size and has a cover in colors illustrating an Eskimo igloo interior with its quaint cooking arrangements. Size 6¾x10 in. Pp. 32.

Why You Are Losing Your Part of $25,000,000 is a well-gotten up booklet showing increased effectiveness of workers due to good air. The booklet is published by the Standard Electro-Utilities Co., Chicago, makers of the Vohr ozone maker, and the value of ozone in purifying the air of offices and similar apartments is dwelt on at length. The increased output is shown by typical instances of the illness of high-salaried employees due directly to the stuffy conditions of their offices Attention is also directed to the "3 o'clock sag," as a result of which, it is stated, in Chicago alone over a million dollars is lost every year. A number of fac-simile testimonials are presented, showing how the Vohr ozone makers actually remedy the poor air conditions in offices. The booklet includes price lists and illustrations. Size 3¾ in. x 7 in. Pp. 28.

Six Little Pointers is the title of a neat little circular published by the McCreery Engineering Co., Detroit. The idea suggested by the title is carried out in the illustration on the cover showing a row of pups. The six pointers, however, are intended to show the most effective way of purifying, cooling or humidifying air. These are given as 1, the drawing of air through a system of water sprays; 2, the use of wet cleaning surfaces; 3, intimate and extended contact of the air with the spray and deflecting surfaces; 4, eliminators to extract free moisture and not for use as cleaning surfaces; 5, movement of air should be the slowest in its passage through the eliminators; 6, purifying device with gushing spray heads. These features, it is pointed out, are contained in the McCreery air washer, manufactured by this company.

H.-O. Pipe Joint Cement, a product of the H. W. Johns-Manville Co., New York, is the subject of a folder in which the point is made that those who are using ready mixed pipe joint cement are paying just as much per pound for the water or oil it contains as for the cement itself. It is claimed that 1 lb. of H.-O. cement goes as far as 4 lbs. of ordinary pipe joint cement, yet costs no more per pound. Another advantage of mixing cement for oneself is that it does not dry out and become worthless. H.-O. pipe joint cement, it is stated, does not become solid like red or white lead, and joints made with it can, therefore, be easily uncoupled without breaking the fittings, yet it does not wash out of the pipes.

We're Rounding Up Customers for You is the title of a clever folder published by the H. W. Johns-Manville Co., New York, calling attention to the company's line of J.-M. asbestos roofing. The folder contains reproductions of some of the more notable advertisements the company is running, showing the extensive publicity being given to this form of roofing and the consequent demand that is being created. There is also a reproduction of many of the magazines in which J.-M. asbestos roofing is being advertised. Over sixty publications are being used, reaching more than 27,500,000 readers in the United States and Canada.

New Contracts

F. W. Lamb Co., Chicago, steam heating school building in Lockport, Ill., for $5,300.

John G. Sutton Co., San Francisco, Cal., steam heating and ventilating 11-story building at Montgomery and Sutter streets, San Francisco, for the San Francisco Investment Co., for $2,940.

Alton Plumbing & Heating Co., Alton, Ill., vacuum steam heating system for St. Joseph's Hospital, at that place, for $4,200.

Mangrum & Otter, San Francisco, Cal., heating and ventilating Agricultural Building at the University of California, at Berkeley. The contract amounts to $6,455.

Samuel A. Esswein Heating & Plumbing Co., Columbus, O., heating new court house at Ottawa, O., for $5,675.

Bradlee & Chapman, Boston, steam fitting in power house and tunnels at the City Hospital for $12,543. Other bids were: Lynch & Woodward, $14,362; Ingalls & Kendricken, $14,500; W. W. Campbell & Sons, $15,732.

Lumsden & Van Stone Co., Boston, steam piping system at the Calf Pasture pumping station, Boston, for $6,285.

Paul Grant, Norfolk, Neb., heating, plumbing and electrical work on additions to Lincoln and Grant schools. The work will amount to $8,698.

Elmer Dovel, Auburn, Neb., heating and plumbing new court house at Pawnee City, Neb., for $6,000.

James Hunter Heating and Construction Co., Albany, N. Y., heating addition to School No. 17 for $6,400.

Steward & Blunt, Skowhegan, Me., heating and plumbing new dormitory building at Colby College, Waterville, for $2,118.

Barret Hardware Co., Joliet, Ill., heating Henderson avenue school. A steam plant will be installed, with mechanical ventilation.

C. O. Burrows & Co., Boston, heating and ventilating new Broad street school in Westfield for $6,837.

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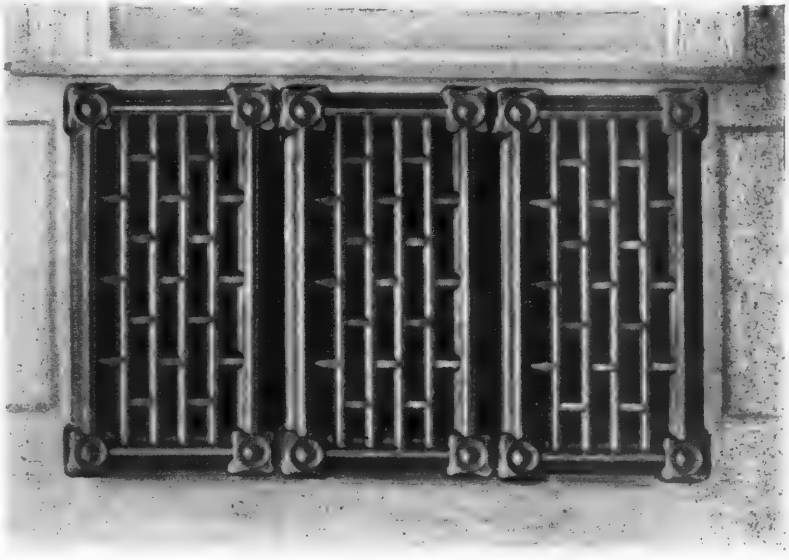
Out Of The Way Radiators



¶ There is an ever-increasing demand for radiators that can be hung off the floor on wall or ceiling, placed in skylights, and still be practical, efficient heating surfaces.

¶ No radiator made adapts itself better to space-saving conditions than the ATHENIAN WALL PATTERN of United States Radiators. Used in factory buildings where space is most valuable, in churches and schools, under windows to stop cold air currents, in assembly halls, stores, garages and all buildings where radiation should be off the floor.

¶ The ATHENIAN WALL PATTERN is a most efficient wall radiator. Made in three sizes, connected with extra heavy right and left hand inside nipples. Has cross-bar circulation which increases its heating value, giving more efficiency than can be had in any other pattern of wall radiator.

¶ Assembled in all shapes at the factory which saves labor cost on the job and they can easily be used in odd corners and out of the way places where regular radiation would be impossible.

¶ It seems to us that you must be interested in this modern space-saving radiator, and we have prepared for your benefit a booklet that illustrates and describes in full the special advantages of this OUT OF THE WAY RADIATOR. It's free—Write for it to-day.

UNITED STATES RADIATOR CORPORATION

GENERAL OFFICES. DETROIT, MICH.

BRANCHES IN PRINCIPAL CITIES

Makers of More Styles of Radiation Than Any Other Individual Manufacturer

TRADE AND MISCELLANEOUS NOTES

Deaths

Peter E. Esswein, treasurer of the Samuel E. Esswein Heating & Plumbing Co., Columbus, O., died at his home in that city June 25.

Augustus W. Mott, second vice-president of the J. L. Mott Iron Works, New York, diel July 2. He was 50 years old. He was the son of Jordan L. Mott.

George F. Hughson, president of the Hughson Steam Specialty Co., Chicago, died July 19 at his home in Chicago, after a short illness. He was 51 years old. Mr. Hughson was for many years vice-president and sales manager of the John Davis Co., which was succeeded by the Hughson Steam Specialty Co. in 1909. Mr. Hughson leaves a widow and a son, Harry H. Hughson, who will succeed him in the management of the company.

Robert B. Humphryes, vice-president of the Humphryes Mfg. Co., Mansfield, O., died July 10. He had been in poor health for several years, but the immediate cause of his death was a stroke of paralysis. Mr. Humphryes was 65 years old and was for many years general manager and superintendent of the Humphyres Mfg. Co. until ill health forced him to relinquish activities.

Miscellaneous Notes

Eastern Supply Association held its summer meeting at Atlantic City, June 22. John McClure Chase presided in the absence of President P. M. Beecher. The association's credit bureau reported that out of claims placed with the bureau amounting to $101,000, over 50% had been collected without additional cost to any member of the association.

New York firms which have been in business for 60 years or more have been listed in connection with the anniversary number of one of the New York dailies.

ROBERT A. KEASBEY CO.
HEAT AND COLD INSULATING MATERIALS
85% Magnesia and Asbestos Pipe and Boiler Coverings
CORK COVERINGS FOR BRINE PIPES, ETC.
ESTIMATES FURNISHED AND CONTRACTS EXECUTED
"RAKCO" BRAND ASBESTOS, FLAX AND RUBBER PACKINGS
For all classes of Marine and Stationary Engines and Pumps
100 North Moore Street NEW YORK CITY
Telephone, 6097 Franklin

ENGINEERS AND STEAMFITTERS REQUIRE GOOD TOOLS
The GENUINE ARMSTRONG Stocks and Dies are
RELIABLE, ACCURATE, EASY WORKING
MANUFACTURED BY
THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.

The list includes the following firms that are manufacturers of heating and plumbing goods: Abendroth Brothers, 109 Beekman St.; Boynton Furnace Co., 106 West 37th St.; Bruce & Cook, 190 Water St.; Hitchings & Co., 233 Mercer St.; J. L. Mott Iron Works, 118 Fifth Ave.; Nason Mfg. Co., 71 Beekman St.; Richardson & Boynton Co., 31 West 31st St.; Rider-Ericcson Engine Co., 35 Warren St., and Tuttle & Bailey Mfg. Co., 76 Madison Ave.

National Association of Brass Manufacturers met in Detroit, June 27, 1911. The next meeting will be held in Cleveland, O., September 20, 1911.

Central Supply Association, at its recent meeting in Detroit, June 28, elected four new firms to membership, as follows: Spencer Heating Co., Chicago; Roberts-Hamilton Co., Minneapolis, Minn.; Novelty Iron Co., Canton, O.; and the Buckeye Tank & Seat Co., Canton, O.

Baltimore, Md.—A plan is being discussed to establish a municipal heating and lighting plant in connection with the fire service pumping station, now being built on South street, between Lombard and Pratt streets, Baltimore. The plan is to heat and light the City Hall, Court House and the two City Hall annexes from the pumping station. It is pointed out that the pumping station has to be kept in readiness at all times for an emergency call, while it may not be in actual service more than once or twice a year. The fuel and power that must be necessarily wasted could, it is believed, be utilized to advantage for heating purposes. The proposition is being advocated by President John Hubert, of the Second Branch City Council.

Milwaukee, Wis.—The recent hot weather in Milwaukee is responsible for the development of a scheme for cooling buildings in which use is made of the building's steam or hot water heating system. The idea is to fill the system with cold water, maintaining a circulation, if necessary, in the warmest weather, by draining the system at frequent intervals. Several degrees of cooling effect are said to have been obtained in this manner in the home of Samuel Walwig, 218 Twenty-third street.

Cleveland, O.—"Blowout Ventilation" is the term that has been applied to the methods adopted in Cleveland for freshening the air in school rooms, whereby at the sound of the gong the children leave their studies and commence marching exercises, calisthenics or run out into the playground while the doors and windows are thrown wide open for a few minutes.

Mexico, Mo.—The city council has granted a 30-year franchise to the Mexico Power Co. for a central heating plant, which is to be installed in the downtown district. The Mexico Power Co. owns the waterworks system, electric light plant and gas plant in that place. It is proposed to utilize the exhaust steam from the electric light plant to heat the city. The franchise covers the residence portion as well.

Wisconsin Master Steam Fitters' Association is the title of an organization formed June 21 at Fond du Lac.

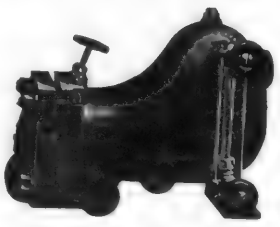
FOR PIPE JOINTS

You can't do better than use Dixon's Pipe-Joint Compound on all pipe joints—keeps all joints tight.

JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J.

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

Watson & McDaniel Co.

160 North 7th Street • PHILADELPHIA, PA.

Send for Catalogue

Twenty delegates were present. Officers were elected as follows: President, M. E. Flaherty, Milwaukee; vice-president, J. F. Ahern, Fond du Lac; secretary, Fred Kauffman, Milwaukee; treasurer, Otto Biefield, Watertown. It is proposed to hold a convention in Milwaukee in the spring.

United Bunch of Sheep, New York Fold, held its mid-summer gambol July 2, at Witzel's Point View Island, College Point, Long Island. A clambake was served. The organization is made up of salesmen in the heating and plumbing supply trade.

International Municipal Congress and Exposition will be held at the Coliseum, Chicago, September 18-30, 1911. As already announced, the subjects which have been decided upon for discussion and the exhibits for exploitation include heating systems for schools, vacuum cleaning equipment and ventilating systems.

Proceedings of the Congress of Technology, held in Boston, April 10-11, will be published in a single volume of about 500 pages, which will be sold at a moderate price. It will contain the seventy-odd technical papers relating to many fields of industry, which were read at the celebration of the fiftieth anniversary of the granting of the charter of the Massachusetts Institute of Technology.

Manufacturers' Notes

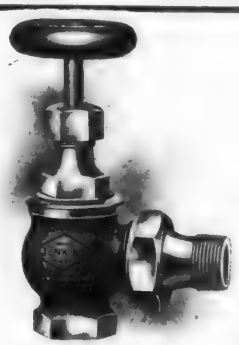
McDonald Vacuum and Vapor Specialty Co., Cleveland, O., has taken offices in the new Swetland Building, in that city.

United States Radiator Corporation, Detroit, Mich., announces the appointment of Edward E. McNair as district sales manager with headquarters in Detroit. Mr. McNair has been manager of the company's Chicago branch.

United States Radiator Corporation, Detroit, Mich., is building a 4-story structure at Broadway and Grand River, Detroit, to be occupied as its general offices.

John Simmons Co., New York, manufacturers and dealers in heating and plumbing supplies, has recently completed a large addition to its factory and machine shop at Charlestown, W. Va., to be devoted exclusively to the manufacture of fire-equipment specialties.

Mayor-Lane Co., New York, dealers in heating and plumbing supplies, has completed the equipment of its new quarters at 340 Hudson street, where it has nearly 30,000 sq. ft. of floor space. The officers of the company are: President and treasurer, Victor A. Harder; secretary, Victor A. Harder, Jr.; manager of sales, Fred G. Ellis.



Jenkins Bros. Radiator Valves

The installation of these valves secures for your clients the heaviest radiator valves made. Highest grade metal and workmanship. Full opening. All parts renewable. Can be packed under pressure.

Jenkins Bros.

New York Boston Philadelphia Chicago

The Empire Low Pressure Steam Trap

Means Trap Satisfaction

The trap question will be settled if you install an EMPIRE. Adapted to all classes of low pressure work. Perfectly automatic in operation. THE SIMPLEST TRAP MADE. Let us send you one on trial. You will be surprised at its low cost too.

ASK FOR BULLETIN 101

AMERICAN DISTRICT STEAM COMPANY

LOCKPORT, N Y. CHICAGO, ILL.

Federal Heater Co., Chicago, the $8.000,000 heater concern, whose formation was reported in last month's issue, will enlarge the foundry, mounting shops and furnace manufacturing plant at Oakley, near Cincinnati, O., which was formerly the plant of the Peck-Williamson Heating and Ventilating Co. The full list of officers is as follows:

President, A. W. Williamson, president of the Peck-Williamson Heating & Ventilating Co.; vice-presidents, L. J. Mueller, secretary of the L. J. Mueller Furnace Co.; John Kerch, president of the Twentieth Century Heating & Ventilating Co.; secretary, D. M. Compton, president of the Quaker Manufacturing Co.; treasurer, F. H. Moore, treasurer of the International Heater Co.; directors: above-named officers and W. C. Williamson, secretary of the Peck-Williamson Heating & Ventilating Co., F. E. Wheeler, president of the International Heater Co., Byron H. Edwards, president of the Ideal Furnace Co., Charles Scheible, The Henry & Scheible Co., L. J. Mueller, Sr., president of the L. J. Mueller Furnace Co., George Maag, vice-president of the Twentieth Century Heating & Ventilating Co., and J. H. Arbogast, attorney.

"Informant" is the title of a new monthly published by the American Blower Co., Detroit, Mich., for exclusive circulation among its branch managers. In addition to fan data, results of tests, etc., the publication will contain news letters from the company's various offices.

Crane Co., Chicago, has purchased the business of J. A. Roe Co., Detroit, jobbers of heating and plumbing supplies, at Bates and Atwater streets. The business will be continued as a branch of Crane Co. The company is planning to make extensive improvements in the building until now occupied by the J. A. Roe Co.

Automatic Water Heater Co., Rockford, Ill., has completed negotiations with Crane Co., Chicago, whereby Crane Co. will handle its output. Mr. Link, an expert in the experimental department of Crane Co., has had the heaters under test. Mr. Link will be the superintendent of the factory at Rockford. The Automatic Water Heater Co. is capitalized at $25,000, the principal stockholders being Mrs. C. B. Miner and A. N. Patterson.

National Steam Specialty Co., Chicago, manufacturers of air valves and other steam specialties, has increased its capital stock from $15,000 to $25,000.

Ideal Heating Journal is the title of a new house organ published by the American Radiator Co., Chicago. Volume 1, No. 1, is dated July, 1911. The journal, it is stated, will be devoted to the advancement of the steam and hot water heating industry. Among the contents of the first number is an illustrated description of the company's Institute of Thermal Research at Buffalo, an article on the wrong and right way of buying coal, and a description, with illustrations, of methods of heating vegetable warehouses. Separate items cover features of the company's various specialties and many miscellaneous notes. The publication is attractively gotten up and is a credit to its publishers.

J-M Sectional Conduit

This is a tile conduit, salt-glazed inside and out. Is absolutely watertight.

Acids, gases or the action of the earth do not affect it. Neither can it be injured by weight or movement of pipes. Practically indestructible.

Easily opened after installation. Can even be taken up and relaid. The most efficient conduit for conveying steam, gas, water, brine or other liquids under ground

Saves 90% of heat lost in transmission through unprotected or poorly insulated pipes

Write for Catalog

H. W. JOHNS-MANVILLE CO.

Baltimore	Kansas City	New York
Boston	London	Philadelphia
Chicago	Los Angeles	Pittsburg
Cleveland	Milwaukee	San Francisco
Dallas	Minneapolis	Seattle
Detroit	New Orleans	St. Louis

(1348)

FOR SALE

Best Automatic Air Valve Made

PATENTS BROAD AND BASIC

Valve is well known and a big seller. All necessary equipment included. Only small capital required. Exceptional opportunity.

For particulars, address

The Argon Mfg. Co.

DENVER

American Engine Co., Bound Brook, N. J., has appointed Harry Marks, 90 West street, New York, as its sole agent in the metropolitan district. Mr. Marks has installed a large number of American-Ball engines, including both simple engines and the American-Ball angle compound types. Special attention is given to the installation of these engines in connection with exhaust steam heating systems.

Hawley Down Draft Furnace Co., Chicago, has secured a nine-acre site in Easton, Pa., on the line of the Lehigh Valley Railroad, where it is planning to build a large plant.

D. Saunders' Sons, Yonkers, N. Y., manufacturers of pipe-threading tools, recently distributed a cash dividend of $35,000 to their 27 employees. The distribution was provided for in the will of the late Leslie Saunders, former head of the firm. Five of the employees, who have been with the firm for nearly 40 years, received over $2,000 each, while the other employees received $1,000 each. The unusual dividend came as a complete surprise to them all.

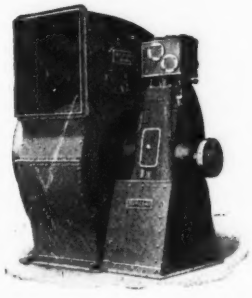
United States Radiator Corporation, Detroit, Mich. has transferred M. D. Keyes from Minneapolis to the metropolitan district, with headquarters at the company's New York office, 5 West 29th street.

Buffalo Forge Co., Buffalo, N. Y., has secured the services of Frank L. Busey, formerly connected with the Engineering Experiment Station of the University of Illinois. Mr. Busey recently made some exhaustive experiments with house-heating boilers and furnaces, his paper on the subject being reproduced in THE HEATING AND VENTILATING MAGAZINE for July, 1911.

American Radiator Co., Chicago, Ill., is placing on the market a new type of stationary vacuum cleaning apparatus. It is electrically driven.

Chapman Valve Co., Indian Orchard, Mass., announces the removal of its New York office to 138 Centre street. F. W. Sleep is the New York manager, and associated with him is C. F. Weber, who will be welcomed back to the trade in New York by his many friends.

Monash-Younker Co., Chicago, manufacturers of the Monash New Noiseless Radifier Valve, against whom an injunction was issued at the instance of the Consolidated Engineering Co., Chicago, restraining the Monash-Younker Co. from selling or installing the Radifier Valve, announces that this injunction has been suspended pending an appeal.



The
Sturtevant
Multivane Fan

The most efficient commercial Fan in the world.

Occupies less space than any other type and can be built to run at the highest speed.

It is carefully designed and rigidly constructed.

Our Engineers will make recommendations to meet specifications or suggest the best method of installation.

B. F. STURTEVANT CO.

HYDE PARK, MASS.

Ask for Catalog 180 V. 831 Offices in principal cities

New Firms and Business Changes

Reading Foundry & Supply Co., Reading Pa., has been organized to manufacture cast-iron soil pipe and fittings. The company will also handle heating and plumbing supplies. President, John G. Fleck; vice-president, John Chase; treasurer, Fred W. Fleck; superintendent of foundries, Edward Stratton; manager, Walter Sippel. The company has a well-equipped soil pipe foundry in Reading.

W. W. Campbell & Son, Boston, Mass., heating and ventilating engineers and contractors, announce their removal to 49 Haverhill street, Boston.

Mehring & Hanson Co., 307-309 West Washington street, Chicago, is the title of a new heating and ventilating engineering and contracting firm of which George Mehring, of Chicago, is president. The other officers are: Vice-president and treasurer, David N. Hanson, Jr.; secretary, George H. Dickerson. Mr. Mehring, the president, is a prominent figure in the heating trade in Chicago. He is a member of the Chicago Master Steam Fitters' Association and is a charter member of the American Society of Heating and Ventilating Engineers. He was formerly for many years with the L. H. Prentice Co., of Chicago.

New Incorporations

Isolated Steam Heating and Maintaining Co., St. Louis, Mo., capital $2,000. Incorporators: William N. Fisher, John Schuedding and Edward Schuedding.

West End Plumbing & Heating Co., Cleveland, O., capital $5,000. Among the incorporators is Albert T. Ball.

McGeorge & Cooper Mfg. Co., Oakland, Cal., capital $100,000, to manufacture gas heating appliances. Incorporators: W. C. McGeorge, C. D. and William Cooper, G. C. Gardner and W. A. Boston.

John J. Cahill Co., Chicago, capital $10,000, to conduct a heating and plumbing contracting business. Incorporators: J. J. Cahill, F. E. Cahill and I. N. Herreid.

Rose & Douglas Co., Ellenville, N. Y., capital $6,000, to engage in heating, plumbing and gas fitting. Directors: William C. Rose, William L. Douglas, both of Ellenville; and Richard T. Childs, East Orange, N. J.

Eastern Blower and Sheet Metal Works, Richmond, Va., capital $25,000. President, D. F. Harrington; vice-president, N. E. Reuter; secretary and treasurer, H. C. Hopkins.

Inland Supply Co., Danville, Ill., capital $35,000, to conduct a heating and plumbing business. Incorporators: H. C. Yelton, O. Finney and George Harroun.

Eastern Sanitary Mfg. Co., New York, capital $150,000, to manufacture and deal in heating and plumbing supplies. Incorporators: Arthur W. Shipman and Francis N. Dede, both of 299 Broadway, New York; and Arthur H. White, Passaic, N. J.

Sanitary Plumbing and Heating Co., Huntington, Ind., capital $6,000.

Independent Plumbing & Heating Co., Oklahoma City, Okla., capital $4,000. Incorporators: J. B. Beach, H. F. Cooper and H. E. Ward, all of Oklahoma City.

National Plumbing & General Supply Co., 110 South 12th street, St. Louis, Mo., capital $100,000, to take over the business of the National Plumbing Supply Co., which failed recently. The company has also purchased the business of the Turner Supply Co., St. Louis. Among the incorporators are Fred G. Turner, George H. Robinson, Robert W. Moore, James R. Claiborne, William R. Scullin and Valle Reyburn, of St. Louis.

National Vacuum Washer Co., Los Angeles, Cal., capital $25,000. Incorporators: C. E. Sturgis, G. E. McDonald and F. Hublet.

H. C. Williams Trap & Valve Co., Milwaukee, Wis., capital $50,000. Incorporators: H. C. Williams, H. L. Williams and E. A. Evans.

Contracts Awarded

R. T. Ford, Rochester, N. Y., heating Building No. 8 at Exposition Park, Rochester, for $3,173.

Lane-Bowen Co., Lorain, O., heating and ventilating Lincoln and Lowell schools and high school building at Lorain. The contracts amount to $22,465.

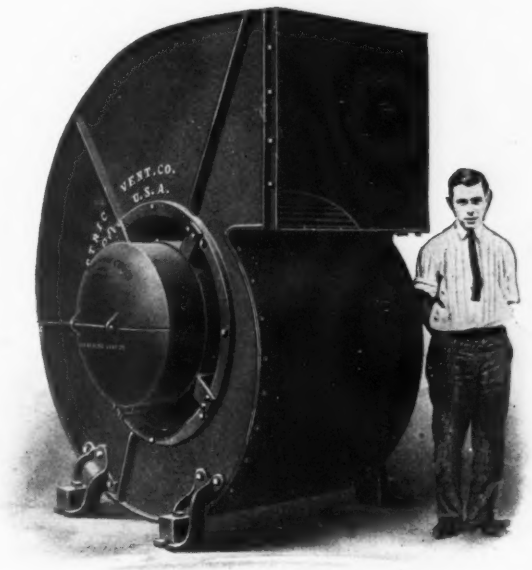
Lewis & Kitchen, Kansas City, Mo., heating Prescott school, Kansas City, for $5,800. A hot-blast system will be installed, supplanting the present steam heating system.

Howe, Defendorf & Buruff, Rochester, N. Y., heating and ventilating Building No. 7 at Exposition Park for $2,250.

Norris & Miller, Detroit, Mich., heating four barrack buildings at Fort Wayne Post.

Peters-Eichler Heating Co., St. Louis, Mo., contract for underground piping connection between Soldan High and Clark schools on Union avenue; also Central High School and Crow School at Grand avenue and School street. The contracts amount to $11,577.

O'Meara Heating Co., St. Louis, Mo., heating new school in the ventilating heating new school and ventilating new school buildings in the Bryan Hill district for $26,600. The plumbing contract went to the Edward Reisel Plumbing Co., at its bid of $10,377.



80" ILG UNIVERSAL BLOWER, direct-connected to 7½ H. P. 3-phase motor. Speed 340 r. p. m. Air Delivery 20,800 c. f. m. Used for Heating and Ventilating the New DELGADO MUSEUM, New Orleans, La
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WRITE TO OUR ENGINEERING DEPARTMENT FOR CATALOG V 30

Ilg Electric Ventilating Company

154 Whiting Street, Chicago

Gillis & Geopheghan, New York, steam equipment for the Capitol power house, at Albany, N. Y., and the steam and return connections between the power house, capitol and educational building. Contract amounts to $202,083.

Jennison Plumbing Co., Fitchburg, Mass., heating and ventilating addition to Priest street school at Leominster for $2,584.

Otto Biefeld & Co., Watertown, Wis., heating and ventilating Webster school in Watertown for $6,090.

Haynes-Kramer Co., Waukesha, Wis., heating and plumbing new $20,000 gymnasium and school building for St. John's Military Academy.

American Heating Co., Duluth, Minn., heating and plumbing new court house at Grand Marais, Minn., for $4,000.

Thomas Heating Co., Racine, Wis., heating and ventilating system in the Northern Michigan asylum at Traverse City, for $28,692.

Correction.—An item in this column in the July issue stating that the Huffman-Conklin Co., Columbus, O., was the low bidder for the heating and plumbing work for the General Hospital buildings in Cincinnati, is an error. We are informed by the architects for these buildings, Samuel Hannaford & Sons, Cincinnati, that the plumbing has been awarded in a general contract to the Westlake Construction Co., of St. Louis, which, in turn, has awarded same to another St. Louis firm. The heating contract has not yet been awarded.

Business Chances

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until August 16, 1911, for the installation of a vacuum cleaning system in the new U. S. post office at New York.

Until August 16, 1911, for the construction, including plumbing, gas piping, heating apparatus, electer electric conduits and wiring and lighting fixtures of the U. S. post office at Massillon, O.

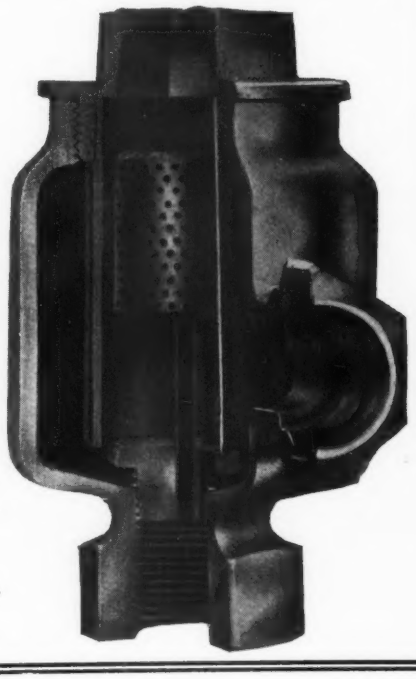
Until August 21, 1911, for the installation of a vacuum cleaning system in the U. S. court house, post office, etc., at Los Angeles, Cal.

Manager Wanted

An experienced ventilating engineer, with executive and selling ability, capable of taking charge of an important branch office of a well-known fan manufacturer, may obtain interesting information by applying at once to THE HEATING AND VENTILATING MAGAZINE.

THE VALVE THAT WORKS

89 Mowell Automatic Relief Valves are installed in the Doherty Silk Mill, in Paterson, one of the most up-to-date plants in the country and THE SYSTEM WORKS PERFECTLY



Send for descriptive matter, telling how the Mowell Automatic Relief Valve is suited to Exhaust and Low Pressure Steam Heating, how it expels all air and water from the radiator and how easy it is to keep clean.

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